CHAPTER 7

NUTRITION AND THE PREVALENCE OF ANAEMIA

This chapter focuses on the nutrition of women and young children, examining both the types of food consumed and the consequences of inadequate nutrition and poor feeding practices. NFHS-1 included basic information about feeding practices and the nutritional status of young children. NFHS-2 contains more comprehensive information on these topics, and, for the first time, information on the diet of women. Measurement of height and weight has been expanded to include ever-married women as well as young children. Two additional tests have been included for the first time—anaemia testing for women and young children and the testing of cooking salt to determine the extent of iodization. A specially trained health investigator attached to each interviewing team conducted height and weight measurements and anaemia testing.

7.1 Women's Food Consumption

The consumption of a wide variety of nutritious foods is important for women's health. Adequate amounts of protein, fat, carbohydrates, vitamins, and minerals are required for a well-balanced diet. Meat, fish, eggs, and milk, as well as pulses and nuts, are rich in protein. Green, leafy vegetables are a rich source of iron, folic acid, vitamin C, carotene, riboflavin, and calcium. Many fruits are also good sources of vitamin C. Bananas are rich in carbohydrates. Papayas, mangoes, and other yellow fruits contain carotene, which is converted to vitamin A. Vitamin A is also present in milk and milk products, as well as egg yolks (Gopalan et al., 1996).

NFHS-2 asked ever-married women how often they consume various types of food (daily, weekly, occasionally, or never). Women consume vegetables (other than green, leafy vegetables) most often (Table 7.1). Almost two-thirds of women consume these vegetables every day and 93 percent of women eat these vegetables at least once a week. Pulses and beans, as well as green, leafy vegetables, are also an important part of the diet. Almost half of women (47 percent) eat pulses or beans every day and 42 percent eat green, leafy vegetables every day. Milk or curd is a common part of the diet for a majority of women, but 45 percent of women consume milk or curd only occasionally or never. Fruits are eaten daily by only 8 percent of women and only one-third of women eat fruits at least once a week. Almost one-third of women in India never eat chicken, meat, or fish and very few women (only 6 percent) eat chicken, meat, or fish every day. Eggs are consumed slightly less often than chicken, meat, or fish.

Table 7.2 shows that there are substantial differentials in food consumption patterns by selected background characteristics. Age does not play an important role in women's consumption patterns. Women in urban areas are more likely than women in rural areas to include every type of food in their diet, particularly nutritious foods such as fruits and milk or curd. Illiterate women have poorer and less varied diets than literate women, and their diet is particularly deficient in the consumption of fruits. Hindus are less likely than Muslims or Christians to eat eggs, chicken, meat, or fish at least once a week. Sikhs and Jains rarely eat chicken, meat, fish, or eggs, but they are more likely than women in any other religious group to consume milk or curd, as well as pulses or beans. Jains are more likely than women in any other religious group to eat fruits at least once a week.

Table 7.1 Women's food consumption

Percent distribution of ever-married women by frequency of consumption of specific foods, India, 1998–99

	Frequency of consumption					Total percent
Type of food	Daily	Weekly	Occasionally	Never	Missing	
Milk or curd	37.5	17.4	34.1	10.9	0.0	100.0
Pulses or beans	46.9	40.8	11.6	0.6	0.0	100.0
Green, leafy vegetables	41.8	43.4	14.3	0.4	0.0	100.0
Other vegetables	65.1	28.0	6.6	0.2	0.0	100.0
Fruits	8.1	24.9	62.2	4.7	0.1	100.0
Eggs	2.8	25.0	37.9	34.2	0.0	100.0
Chicken, meat, or fish	5.8	26.1	37.3	30.8	0.0	100.0

Table 7.2 Women's food consumption by background characteristics

Percentage of ever-married women consuming specific foods at least once a week by selected background characteristics, India, 1998–99

	Type of food							Number of women
Background characteristic	Milk or curd	Pulses or beans	Green, leafy vegetables	Other vegetables	Fruits	Eggs	Chicken, meat, or fish	
Age								
15–24	53.3	88.1	85.5	92.7	30.8	28.2	31.3	24,571
25–34	55.4	87.7	85.5	93.2	34.0	28.6	32.5	32,839
35–49	55.8	87.6	84.8	93.3	33.7	26.7	31.8	31,789
Residence								
Urban	65.3	92.8	88.4	95.0	53.9	39.7	41.7	23,370
Rural	51.3	86.0	84.1	92.4	25.6	23.6	28.5	65,829
Education								
Illiterate	46.5	85.0	83.8	91.6	20.8	22.5	25.9	51,871
Literate, < middle school complete	57.3	90.1	85.6	94.5	37.6	34.4	41.2	17,270
Middle school complete	65.4	91.8	87.8	95.3	47.5	35.9	41.5	7,328
High school complete and above	80.2	93.8	89.3	96.3	68.4	36.1	38.5	12,719
Religion								
Hindu	55.7	88.5	85.1	93.0	31.9	24.9	27.5	72,903
Muslim	46.8	83.7	85.8	93.8	32.9	44.1	55.7	11,190
Christian	53.7	78.2	76.5	93.6	53.0	49.7	70.1	2,263
Sikh	91.0	98.7	97.3	97.9	48.2	11.8	5.1	1,427
Jain	82.3	94.7	88.2	87.9	70.9	2.3	2.3	331
Buddhist/Neo-Buddhist	43.4	92.1	93.4	88.9	41.0	48.1	51.2	676
Other	23.3	74.0	91.6	87.4	27.8	31.7	43.8	285
No religion	31.3	67.0	94.5	87.9	40.7	32.7	64.3	44
Caste/tribe								
Scheduled caste	44.9	85.6	84.5	93.2	24.5	27.5	32.6	16,301
Scheduled tribe	34.4	80.6	81.5	87.6	20.9	21.9	25.7	7,750
Other backward class	57.8	89.4	84.7	93.9	33.5	29.8	31.8	29,383
Other	62.1	89.0	86.9	93.6	39.7	27.8	33.4	34,904
Standard of living index								
Low	35.0	81.4	82.1	91.6	17.0	23.8	29.1	29,033
Medium	58.1	89.4	85.3	93.1	31.5	28.6	33.1	41,289
High	80.0	94.3	90.0	95.7	62.0	32.3	33.6	17,845
Total	55.0	87.8	85.2	93.1	33.0	27.8	31.9	89,199

Note: Total includes 11, 79, 862, and 1,032 women with missing information on education, religion, caste/tribe, and the standard of living index, respectively, who are not shown separately.

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Women from scheduled tribes have a relatively poor diet that is particularly deficient in fruits and milk or curd. In fact, scheduled-tribe women are less likely than women in any other caste/tribe group to consume each of the food items shown. Women from scheduled castes and other backward classes also have relatively poor diets compared with women in the 'other' category. As expected, poverty has a strong negative effect on the consumption of nutritious types of food. Women in households with a low standard of living are less likely than other women to eat each type of food listed, and their diet is particularly deficient in fruits and milk or curd.

Table 7.3 provides information on the regular consumption of specific foods by state. More than 90 percent of women in Haryana and Punjab consume milk or curd at least once a week, whereas less than 20 percent of women in Manipur and Arunachal Pradesh consume milk or curd regularly. Pulses and beans are eaten regularly by a majority of women in every state except Manipur. Green, leafy vegetables are eaten regularly by at least 70 percent of women in every state except Kerala, where only 55 percent of women eat green, leafy vegetables on a regular basis. Regular consumption of other vegetables is common everywhere, ranging from less than 80 percent in Arunachal Pradesh and Rajasthan to more than 99 percent in Punjab, Haryana, and Gujarat. The regular consumption of fruits varies widely from less than 20 percent in Uttar Pradesh and the three eastern states to 72 percent in Himachal Pradesh. The consumption of eggs is well below average in all of the northern and central states, as well as in Gujarat, Manipur, Orissa, and Bihar. The regular consumption of chicken, meat, or fish is very low throughout Northern and Central India (with the exception of Jammu and Kashmir), as well as Gujarat. Not more than 15 percent of women in any of these states eat chicken, meat, or fish at least once a week. The regular consumption of these foods is relatively high throughout the Northeast, as well as West Bengal, Goa, and most states in the South.

7.2   Nutritional Status of Women

In NFHS-2, ever-married women age 15–49 were weighed using a solar-powered digital scale with an accuracy of ±100 grams. Their height was measured using an adjustable wooden measuring board specially designed to provide accurate measurements (to the nearest 0.1 cm) of women and children in a field situation. The weight and height data were used to calculate several indicators of women's nutritional status as shown in Table 7.4. The height of an adult is an outcome of several factors including nutrition during childhood and adolescence. A woman's height can be used to identify women at risk of having a difficult delivery, since small stature is often related to small pelvic size. The risk of having a baby with a low birth weight is also higher for mothers who are short.

The cutoff point for height, below which a woman can be identified as nutritionally at risk, varies among populations, but it is usually considered to be in the range of 140–150 centimetres (cm). NFHS-2 found a mean height for women in India of 151 cm. The mean height varies only slightly (between 150 and 155 cm) for women in different population groups, as shown in Table 7.4. Sikh women and Jain women are taller, on average, than women in any other group. Thirteen percent of women are under 145 cm in height. The percentage of women who are below 145 cm does not vary much by age, marital status, or residence, but there is a strong negative relationship between this measure of height and both education and the standard of living index. The percentage of women who are short varies most by religion, ranging from

Table 7.3 Women's food consumption by state

Percentage of ever-married women consuming specific foods at least once a week by state, India, 1998–99

State	Type of food						
	Milk or curd	Pulses or beans	Green, leafy vegetables	Other vegetables	Fruits	Eggs	Chicken, meat, or fish
India	55.0	87.8	85.2	93.1	33.0	27.8	31.9
North							
Delhi	73.3	91.2	86.8	92.8	57.8	21.2	15.1
Haryana	93.2	99.3	99.2	99.2	54.8	7.7	3.8
Himachal Pradesh	87.0	99.1	94.3	98.8	71.7	14.7	6.2
Jammu & Kashmir	72.1	68.5	85.5	88.3	44.0	14.2	31.1
Punjab	91.1	99.2	99.1	99.5	50.7	10.8	3.6
Rajasthan	70.7	81.4	77.8	78.9	20.5	6.1	7.8
Central							
Madhya Pradesh	32.5	79.9	80.9	86.1	22.7	11.7	11.2
Uttar Pradesh	57.2	88.0	90.0	90.7	19.0	9.9	8.7
East							
Bihar	46.7	88.7	96.0	96.1	18.3	22.1	21.5
Orissa	20.7	80.7	90.9	95.8	14.4	15.6	28.2
West Bengal	25.0	76.3	91.4	98.7	15.0	43.5	69.0
Northeast							
Arunachal Pradesh	19.9	51.2	95.6	72.7	28.9	33.5	57.4
Assam	41.7	85.3	87.6	94.9	33.3	58.4	57.7
Manipur	15.3	37.3	96.9	93.2	34.3	14.8	47.4
Meghalaya	23.7	61.5	88.9	91.8	40.3	32.6	61.8
Mizoram	22.9	64.5	99.2	87.1	61.6	42.5	59.3
Nagaland	82.7	59.6	96.3	80.6	40.9	30.2	72.3
Sikkim	72.4	82.9	94.9	87.5	28.8	26.8	57.1
West							
Goa	65.0	76.5	74.6	82.5	65.8	36.6	89.0
Gujarat	80.0	97.0	74.1	99.2	44.4	14.0	12.4
Maharashtra	47.3	94.5	87.9	91.1	44.7	34.4	38.2
South							
Andhra Pradesh	72.0	92.3	72.7	95.7	47.6	59.7	56.7
Karnataka	75.5	98.6	93.3	91.8	53.7	39.9	33.9
Kerala	45.3	69.8	54.8	90.9	56.5	27.3	82.8
Tamil Nadu	66.5	94.6	77.6	98.7	46.2	52.7	52.6

4–8 percent for Sikhs and Jains to 24–25 percent for women with 'other' religions and no religion. By caste/tribe, scheduled caste women are most likely to be short (17 percent).

Table 7.4 also shows several measures of an index that relates a woman's weight to her height. The body mass index (BMI) can be used to assess both thinness and obesity. The BMI is defined as the weight in kilograms divided by the height in metres squared (kg/m^2). This index excludes women who were pregnant at the time of the survey or women who had given birth during the two months preceding the survey. The mean BMI for women in India is 20.3 (varying within the narrow range of 19–23 for the different groups shown in the table). Chronic energy deficiency is usually indicated by a BMI of less than 18.5. More than one-third (36 percent) of women have a BMI below 18.5, indicating a high prevalence of nutritional deficiency. Nutritional problems are particularly serious for rural women, illiterate women, women from 'other' religions, scheduled-caste and scheduled-tribe women, working women who are not self-employed, and women who live in households with a low standard of living.

Table 7.4 Nutritional status of women

Among ever-married women, mean height, percentage with height below 145 cm, mean body mass index (BMI), and percentage with specified levels of BMI by selected background characteristics, India, 1998–99

	Height			Weight-for-height[1]				
Background characteristic	Mean height (cm)	Percent-age below 145 cm	Number of women for height	Mean body mass index (BMI)	Percent-age with BMI below 18.5 kg/m^2	Percent-age with BMI of 25.0 kg/m^2 or more	Percent-age with BMI of 30.0 kg/m^2 or more	Number of women for BMI
Age								
15–19	150.6	14.7	7,480	19.3	38.8	1.7	0.1	6,707
20–24	151.2	13.0	15,185	19.3	41.8	3.6	0.4	12,928
25–29	151.4	12.4	16,618	19.8	39.1	7.3	1.2	15,030
30–34	151.5	12.3	14,051	20.4	35.0	11.7	2.4	13,399
35–49	151.2	13.7	29,451	21.1	31.1	16.8	3.9	29,056
Marital status								
Currently married	151.3	13.1	77,737	20.3	35.6	10.6	2.2	72,093
Not currently married	150.8	14.8	5,049	20.1	39.3	10.3	2.1	5,026
Residence								
Urban	151.6	12.0	21,690	22.1	22.6	23.5	5.8	20,563
Rural	151.1	13.6	61,095	19.6	40.6	5.9	0.9	56,556
Education								
Illiterate	150.6	15.4	47,773	19.5	42.6	5.1	0.9	44,251
Literate, < middle school complete	151.4	12.2	16,253	20.6	32.6	12.9	2.7	15,234
Middle school complete	152.0	9.8	6,908	21.1	28.0	15.7	3.2	6,447
High school complete and above	152.9	7.7	11,840	22.5	17.8	26.0	6.4	11,178
Religion								
Hindu	151.1	13.5	67,895	20.1	36.9	9.6	2.0	63,394
Muslim	151.5	12.3	10,108	20.5	34.1	12.4	2.8	9,207
Christian	152.1	10.3	2,100	21.4	24.6	17.6	3.4	1,981
Sikh	155.0	3.9	1,358	23.0	16.4	30.1	8.0	1,280
Jain	153.6	7.6	300	23.4	15.8	33.7	9.8	286
Buddhist/Neo-Buddhist	149.9	17.3	638	20.4	33.3	10.5	2.8	607
Other	149.5	24.6	270	19.2	49.4	7.0	0.4	261
No religion	149.8	24.1	42	20.6	34.5	13.8	3.4	37
Caste/tribe								
Scheduled caste	150.3	17.0	15,234	19.5	42.1	5.8	0.9	14,040
Scheduled tribe	150.8	13.5	7,175	19.1	46.3	3.3	0.5	6,590
Other backward class	151.0	13.5	27,295	20.2	35.8	9.4	1.7	25,474
Other	152.0	10.9	32,334	21.0	30.5	15.4	3.7	30,345
Work status								
Working in family farm/business	151.5	11.4	11,877	19.5	41.9	5.2	0.8	11,114
Employed by someone else	150.8	14.7	16,301	19.5	44.3	6.4	1.2	15,512
Self-employed	150.8	15.4	4,133	20.5	35.0	12.1	2.5	3,955
Not worked in past 12 months	151.3	12.9	50,450	20.7	31.6	13.1	2.9	46,514
Standard of living index								
Low	150.0	17.7	26,687	18.9	48.1	2.6	0.3	24,589
Medium	151.3	12.5	38,451	20.1	35.6	8.6	1.5	35,732
High	153.0	7.5	16,706	22.7	17.3	27.2	6.8	15,938
Total	151.2	13.2	82,785	20.3	35.8	10.6	2.2	77,119

Note: Total includes women with missing information on education, religion, caste/tribe, work status, and the standard of living index, who are not shown separately.
[1]Excludes women who are pregnant and women with a birth in the preceding two months. The body mass index (BMI) is the ratio of the weight in kilograms to the square of the height in metres (kg/m^2).

Table 7.5 Nutritional status of women by state

Among ever-married women, mean height, percentage with height below 145 cm, mean body mass index (BMI), and percentage with specified levels of BMI by state, India, 1998–99

| State | Height | | Weight-for-height[1] | | | |
	Mean height (cm)	Percentage below 145 cm	Mean body mass index (BMI)	Percentage with BMI below 18.5 kg/m^2	Percentage with BMI of 25.0 kg/m^2 or more	Percentage with BMI of 30.0 kg/m^2 or more
India	151.2	13.2	20.3	35.8	10.6	2.2
North						
Delhi	152.5	9.9	23.7	12.0	33.8	9.2
Haryana	154.3	4.6	21.3	25.9	16.6	3.9
Himachal Pradesh	152.7	6.1	20.8	29.7	13.1	2.3
Jammu & Kashmir	153.5	6.7	21.0	26.4	13.8	3.0
Punjab	154.5	4.1	23.0	16.9	30.2	9.1
Rajasthan	153.7	5.6	19.9	36.1	7.1	1.6
Central						
Madhya Pradesh	151.7	10.8	19.8	38.2	6.1	1.2
Uttar Pradesh	150.3	16.4	20.0	35.8	7.5	1.5
East						
Bihar	149.5	19.5	19.4	39.3	3.7	0.5
Orissa	150.5	14.9	19.2	48.0	4.4	0.6
West Bengal	150.0	19.2	19.7	43.7	8.6	1.3
Northeast						
Arunachal Pradesh	150.8	11.9	21.0	10.7	5.1	0.6
Assam	149.9	17.3	20.1	27.1	4.2	0.7
Manipur	151.5	10.3	21.1	18.8	10.8	1.2
Meghalaya	150.6	21.1	20.3	25.8	5.8	1.2
Mizoram	151.6	10.7	20.4	22.6	5.3	0.5
Nagaland	151.6	10.6	20.9	18.4	8.2	0.7
Sikkim	150.2	14.8	22.0	11.2	15.7	2.5
West						
Goa	151.8	12.3	21.6	27.1	21.2	4.3
Gujarat	151.8	10.2	20.7	37.0	15.8	4.4
Maharashtra	151.4	11.9	20.2	39.7	11.7	2.9
South						
Andhra Pradesh	151.2	12.7	20.3	37.4	12.0	2.2
Karnataka	152.0	9.6	20.4	38.8	13.6	2.9
Kerala	152.6	8.8	22.0	18.7	20.6	3.8
Tamil Nadu	151.5	12.0	21.0	29.0	14.7	2.7

[1]Excludes women who are pregnant and women with a birth in the preceding two months. The body mass index (BMI) is the ratio of the weight in kilograms to the square of the height in metres (kg/m^2).

Obesity is becoming a substantial problem among several groups of women in India, particularly women living in urban areas, women who are well educated, and women from households with a high standard of living. Approximately one-quarter of women in each of these groups have a BMI of 25 or more and 6–7 percent have a BMI of 30 or more. In addition to being relatively tall, Sikh and Jain women are more likely than women in any other group to be obese.

State differentials in the mean height of women are not large, but women in the Northern Region are 1–3 cm taller than average (Table 7.5). The shortest women are from the Eastern Region, as well as Uttar Pradesh and parts of the Northeast. A similar pattern is evident for the percentage of women below 145 cm. The mean body mass index also varies within a narrow range, from 19.2 in Orissa to 23.7 in Delhi. Arunachal Pradesh, Sikkim, and Delhi have the

lowest percentage of women with a low BMI (11–12 percent) and Orissa has the highest percentage (48 percent). The level of obesity is much higher in Delhi and Punjab than in any other state. Over 30 percent of women in these two states have a BMI of at least 25 and 9 percent have a BMI of at least 30. Other states with particularly high levels of obesity are Goa and Kerala (21 percent each). Obesity is least common (less than 10 percent) in all parts of Central and Eastern India, most states in the Northeast, and Rajasthan.

7.3   Anaemia Among Women

Anaemia is characterized by a low level of haemoglobin in the blood. Haemoglobin is necessary for transporting oxygen from the lungs to other tissues and organs of the body. Anaemia usually results from a nutritional deficiency of iron, folate, vitamin B_{12}, or some other nutrients. This type of anaemia is commonly referred to as iron-deficiency anaemia. Iron deficiency is the most widespread form of malnutrition in the world, affecting more than two billion people (Stolzfus and Dreyfuss, 1998). In India, anaemia affects an estimated 50 percent of the population (Seshadri, 1998).

Anaemia may have detrimental effects on the health of women and children and may become an underlying cause of maternal mortality and perinatal mortality. Anaemia also results in an increased risk of premature delivery and low birth weight (Seshadri, 1997). Early detection of anaemia can help to prevent complications related to pregnancy and delivery, as well as child-development problems. Information on the prevalence of anaemia can be useful for the development of health-intervention programmes designed to prevent anaemia, such as iron-fortification programmes. In India, under the Government's Reproductive and Child Health Programme, iron and folic acid tablets are provided to pregnant women in order to prevent anaemia during pregnancy.

Because anaemia is such a serious health problem in India, NFHS-2 undertook direct measurement of the haemoglobin levels of all ever-married women age 15–49 and their children under three years of age. Measurements were taken in the field using the HemoCue system[1]. This system uses a single drop of blood from a finger prick (or heel prick in the case of infants under six months old), which is drawn into a cuvette and then inserted into a portable, battery-operated instrument[2]. In less than one minute, the haemoglobin concentration is indicated on a digital read-out.

Before the anaemia testing was undertaken in a household, the health investigator read a detailed informed consent statement to the respondent, informing her about anaemia, describing the procedure to be followed for the test, and emphasizing the voluntary nature of the test. She was then asked whether or not she would consent to have the test done for herself and her young children, if any. The health investigator then signed the questionnaire at the bottom of the statement to indicate that it had been read to the respondent and recorded her agreement or lack

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[1]The HemoCue instrument has been used extensively throughout the world for estimating the concentration of haemoglobin in capillary blood in field situations. The HemoCue has been found to give accurate results on venous blood samples, comparable to estimates from more sophisticated laboratory instruments (Von Schenk et al., 1986; McNulty et al., 1995; Krenzicheck and Tanseco, 1996). A recent small-scale study in India (Prakash et al., 1999), however, found that the HemoCue provided slightly higher estimates of haemoglobin than the standard blood cell counter (BCC) method.

[2]Because the first 2–3 drops of blood are wiped away to be sure that the sample used for analysis consists of fresh capillary blood, it is actually the third or fourth drop of blood that is drawn into the cuvette.

of agreement to the testing. If the test was conducted, at the end of the test the respondent was given a written record of the results for herself and each of her young children. In addition, the health investigator described to her the meaning of the results and advised her if medical treatment was necessary. In cases of severe anaemia, the respondent was read an additional statement asking whether or not she would give her permission for the survey organization to inform a local health official about the problem. For each Primary Sampling Unit, a local health official was given a list of severely anaemic women (and children) who had consented to the referral.

Table 7.6 and Figure 7.1 show anaemia levels for ever-married women age 15–49. Three levels of severity of anaemia are distinguished: mild anaemia (10.0–10.9 grams/decilitre for pregnant women and 10.0–11.9 g/dl for nonpregnant women), moderate anaemia (7.0–9.9 g/dl), and severe anaemia (less than 7.0 g/dl). Appropriate adjustments in these cutoff points were made for women living at altitudes above 1,000 metres and women who smoke, since both of these groups require more haemoglobin in their blood (Centers for Disease Control and Prevention, 1998).

In India, haemoglobin levels were tested for 88 percent of women (see Table D.3 in Appendix D). Overall, 52 percent of women have some degree of anaemia[3]. Thirty-five percent of women are mildly anaemic, 15 percent are moderately anaemic, and 2 percent are severely anaemic. There are some differences in the prevalence of anaemia by background characteristics, but anaemia is substantial for women in every population group. The prevalence of anaemia is slightly higher for younger women less than age 25 than for older women and for women who are not currently married than for currently married women. It is considerably higher for rural women (54 percent) than for urban women (46 percent). Anaemia decreases steadily with increases in the level of educational attainment, from 56 percent among illiterate women to 40 percent among women who have completed at least high school. Anaemia also decreases steadily with increases in the standard of living index. About half of Hindu, Muslim, and Buddhist women are anaemic. Anaemia is slightly lower among Christians and substantially lower among Sikhs and Jains. The highest levels of anaemia are evident for women from 'other' religions and women with no religion. By caste/tribe, scheduled-tribe women have the highest levels of anaemia (65 percent), followed by scheduled-caste women (56 percent) and women from other backward classes (51 percent). Women who are not in any of these three groups have the lowest level of anaemia (48 percent). The prevalence of anaemia does not vary much by work status, but women who do not work have slightly less anaemia than working women.

The prevalence of anaemia is slightly higher for breastfeeding women than for other groups, but there is no difference in the prevalence of anaemia between pregnant women and nonpregnant women who are not breastfeeding. Since anaemia is often considered to be particularly problematic for pregnant women, it is noteworthy that these women have slightly lower than average levels of anaemia. The provision of iron and folic acid supplements to pregnant women has undoubtedly reduced the overall prevalence of anaemia in pregnant women (58 percent of pregnant women received IFA tablets or syrup during pregnancy for births in the

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[3]If the hemoglobin measurements are not adjusted for smoking and for the altitude of the enumeration area, the estimated prevalence of anaemia is slightly lower (51 percent of women would be defined as anaemic instead of 52 percent). The small impact of the adjustment factor is to be expected since, in India, less than 3 percent of women age 15 and over smoke (see Table 2.16), and 90 percent of the sample PSUs (2,836 of the 3,165 PSUs) are at an altitude below 1,000 metres.

Table 7.6 Anaemia among women

Percentage of ever-married women classified as having iron-deficiency anaemia by degree of anaemia, according to selected background characteristics, India, 1998–99

Background characteristic	Percentage of women with any anaemia	Percentage of women with:			Number of women
		Mild anaemia	Moderate anaemia	Severe anaemia	
Age					
15–19	56.0	36.2	17.9	1.9	7,117
20–24	53.8	34.8	17.0	2.0	14,560
25–29	51.4	34.8	14.7	1.9	15,965
30–34	50.5	34.8	13.7	1.9	13,595
35–49	50.5	35.1	13.6	1.9	28,426
Marital status					
Currently married	51.5	34.9	14.8	1.8	74,830
Not currently married	55.5	36.6	15.7	3.1	4,833
Residence					
Urban	45.7	32.0	12.2	1.5	20,872
Rural	53.9	36.1	15.8	2.0	58,791
Education					
Illiterate	55.8	36.7	16.8	2.3	45,818
Literate, < middle school complete	50.1	34.4	13.8	1.9	15,735
Middle school complete	48.0	34.0	12.6	1.3	6,718
High school complete and above	40.3	29.7	9.7	0.9	11,381
Religion					
Hindu	52.4	35.5	15.0	2.0	65,507
Muslim	49.6	34.2	14.2	1.3	9,545
Christian	47.1	30.7	14.4	2.0	2,007
Sikh	39.6	26.6	11.8	1.2	1,315
Jain	42.5	30.8	10.9	0.8	290
Buddhist/Neo-Buddhist	48.6	30.1	15.3	3.1	630
Other	75.7	47.3	24.6	3.8	265
No religion	59.5	34.2	24.9	0.4	40
Caste/tribe					
Scheduled caste	56.0	37.2	16.5	2.3	14,657
Scheduled tribe	64.9	41.2	21.4	2.3	6,908
Other backward class	50.7	34.3	14.5	2.0	26,246
Other	47.6	33.3	12.9	1.5	31,112
Work status					
Working in family farm/business	53.1	35.7	15.2	2.2	11,450
Employed by someone else	54.9	35.8	16.2	3.0	15,671
Self-employed	52.2	35.0	15.3	2.0	3,974
Not worked in past 12 months	50.4	34.6	14.3	1.5	48,543
Standard of living Index					
Low	60.2	38.9	18.6	2.7	25,620
Medium	50.3	34.5	14.1	1.7	37,107
High	41.9	30.1	10.7	1.1	16,034

Contd…

three years preceding the survey—see Table 8.6). However, by far the highest levels of moderate anaemia are experienced by pregnant women (25 percent), and pregnant women also are subject to a somewhat higher level of severe anaemia. For this reason, anaemia remains a serious problem among pregnant women.

Table 7.6 Anaemia among women (contd.)

Percentage of ever-married women classified as having iron-deficiency anaemia by degree of anaemia, according to selected background characteristics, India, 1998–99

Background characteristic	Percentage of women with any anaemia	Percentage of women with:			Number of women
		Mild anaemia	Moderate anaemia	Severe anaemia	
Pregnancy/breastfeeding status					
Pregnant	49.7	21.8	25.4	2.5	5,654
Breastfeeding (not pregnant)	56.4	38.9	15.8	1.6	19,054
Nonpregnant/non-breastfeeding	50.4	35.1	13.4	1.9	54,954
Height					
< 145 cm	56.2	36.5	17.2	2.5	10,515
≥ 145 cm	51.1	34.8	14.5	1.8	68,987
Body mass index					
< 18.5 kg/m^2	56.8	37.0	17.1	2.7	27,743
≥ 18.5 kg/m^2	49.1	34.0	13.7	1.5	51,336
Fruit and vegetable consumption[1]					
Fruit and vegetables	46.7	32.2	12.9	1.7	23,740
Fruit only	42.9	30.9	10.9	1.2	2,554
Vegetables only	55.1	36.9	16.1	2.0	44,207
Neither	51.5	34.7	14.7	2.0	9,142
Total	51.8	35.0	14.8	1.9	79,663

Note: The haemoglobin levels are adjusted for altitude of the enumeration area and for smoking when calculating the degree of anaemia. Total includes 10, 65, 741, 26, 902, 161, 584, and 20 women with missing information on education, religion, caste/tribe, work status, the standard of living index, height, body mass index, and fruit and vegetable consumption, respectively, who are not shown separately.
[1]Based on consumption at least weekly. Vegetables include only green, leafy vegetables.

Figure 7.1
Anaemia Among Women
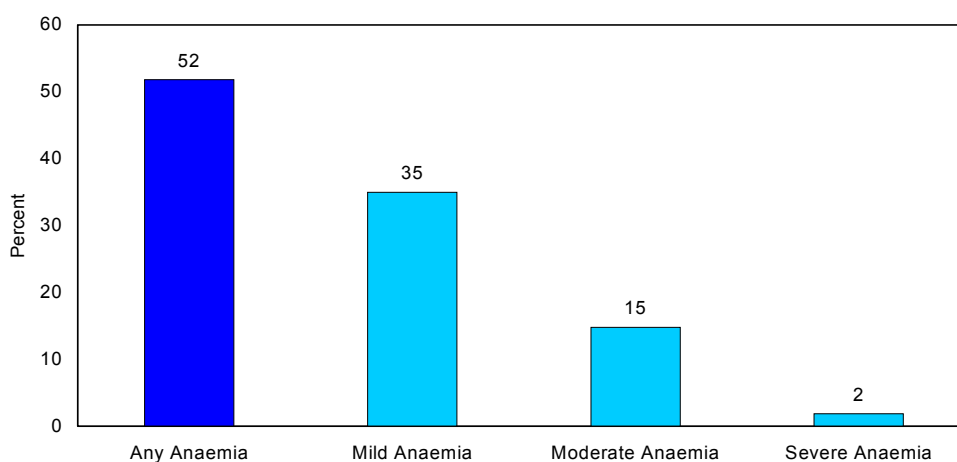
NFHS-2, India, 1998–99

Shorter women and women with a low body mass index have a somewhat higher prevalence of anaemia than other women. The diet of women also plays a role in the likelihood that they have anaemia. Consumption of iron-rich foods can reduce the prevalence or severity of anaemia, and the absorption of iron from the diet can be enhanced (for example, by vitamin C) or inhibited (for example, by tea or coffee) if particular items are consumed around the time that a meal is eaten. Women who eat fruit at least once a week are less likely to be anaemic than women who eat fruit less often or not at all. The consumption of green, leafy vegetables, however, does not appear to have any protective effect against anaemia. In fact, women who regularly consume green, leafy vegetables, but not fruit, have the highest prevalence of anaemia (55 percent).

Levels of anaemia are substantial in every state in India (Table 7.7). The lowest prevalence of anaemia is found in Kerala (23 percent), Manipur (29 percent), Goa (36 percent), and Nagaland (38 percent). The majority of women are anaemic in 10 states, and anaemia is particularly pronounced in the Eastern Region and in many of the states in the Northeastern Region. More than one-quarter of women suffer from moderate to severe anaemia in Meghalaya and Assam. In interpreting state differentials in anaemia, it is important to note that anaemia has multiple causes in addition to the low intake of iron-rich foods. These include the low dietary intake of enhancers of iron absorption, the presence in the diet of inhibitors of iron absorption, overcooking of food, and parasitic infestations. More research is needed on these and other factors to better understand the underlying causes of high anaemia levels and the differentials across states and population subgroups.

7.4   Infant Feeding Practices

Infant feeding practices have significant effects on both mothers and children. Mothers are affected through the influence of breastfeeding on the period of postpartum infertility, and hence on fertility levels and the length of birth intervals. These effects vary by both the duration and intensity of breastfeeding. Proper infant feeding, starting from the time of birth, is important for the physical and mental development of the child. Breastfeeding improves the nutritional status of young children and reduces morbidity and mortality. Breast milk not only provides important nutrients but also protects the child against infection. The timing and type of supplementary foods introduced in an infant's diet also have significant effects on the child's nutritional status.

The Baby Friendly Hospitals Initiative, launched by the United Nations Children's Fund (UNICEF), recommends initiation of breastfeeding immediately after childbirth. The World Health Organization (WHO) and UNICEF recommend that infants should be given only breast milk for about the first six months of their life. Under the Reproductive and Child Health Programme, the Government of India recommends that infants should be exclusively breastfed from birth to age four months (Ministry of Health and Family Welfare, n.d.). Most babies do not require any other foods or liquids during this period. By age seven months, adequate and appropriate complementary foods should be added to the infant's diet in order to provide sufficient nutrients for optimal growth. It is recommended that breastfeeding should continue, along with complementary foods, through the second year of life or beyond. It is further recommended that a feeding bottle with a nipple should not be used at any age, for reasons related mainly to sanitation and the prevention of infections.

Table 7.7 Anaemia among women by state

Percentage of ever-married women classified as having iron-deficiency anaemia by degree of anaemia, according to state, India, 1998–99

State	Percentage of women with any anaemia	Percentage of women with:		
		Mild anaemia	Moderate anaemia	Severe anaemia
India	51.8	35.0	14.8	1.9
North				
Delhi	40.5	29.6	9.6	1.3
Haryana	47.0	30.9	14.5	1.6
Himachal Pradesh	40.5	31.4	8.4	0.7
Jammu & Kashmir	58.7	39.3	17.6	1.9
Punjab	41.4	28.4	12.3	0.7
Rajasthan	48.5	32.3	14.1	2.1
Central				
Madhya Pradesh	54.3	37.6	15.6	1.0
Uttar Pradesh	48.7	33.5	13.7	1.5
East				
Bihar	63.4	42.9	19.0	1.5
Orissa	63.0	45.1	16.4	1.6
West Bengal	62.7	45.3	15.9	1.5
Northeast				
Arunachal Pradesh	62.5	50.6	11.3	0.6
Assam	69.7	43.2	25.6	0.9
Manipur	28.9	21.7	6.3	0.8
Meghalaya	63.3	33.4	27.5	2.4
Mizoram	48.0	35.2	12.1	0.7
Nagaland	38.4	27.8	9.6	1.0
Sikkim	61.1	37.3	21.4	2.4
West				
Goa	36.4	27.3	8.1	1.0
Gujarat	46.3	29.5	14.4	2.5
Maharashtra	48.5	31.5	14.1	2.9
South				
Andhra Pradesh	49.8	32.5	14.9	2.4
Karnataka	42.4	26.7	13.4	2.3
Kerala	22.7	19.5	2.7	0.5
Tamil Nadu	56.5	36.7	15.9	3.9

Note: The haemoglobin levels are adjusted for altitude of the enumeration area and for smoking when calculating the degree of anaemia.

WHO has suggested several indicators of breastfeeding practices to guide countries in gathering information for measuring and evaluating infant feeding practices. These indicators include the ever breastfed rate, the exclusive breastfeeding rate, the timely complementary feeding rate, the continued breastfeeding rate, and the bottle feeding rate. The *exclusive breastfeeding rate* is defined as the proportion of infants under age four months who receive only breast milk. The *timely complementary feeding rate* is the proportion of infants age 6–9 months who receive both breast milk and solid or semi-solid food. The *continued breastfeeding rate through one year of age* is the proportion of children age 12–15 months who are still breastfed. The *continued breastfeeding rate until two years of age* is the proportion of children age 20–23 months who are still breastfed. The *bottle feeding rate* is the proportion of infants who are fed using a bottle with a nipple. These indicators of breastfeeding and other feeding practices are presented in this section.

In NFHS-2, data on breastfeeding and complementary feeding were obtained from a series of questions in the Woman's Questionnaire. These questions pertain to births since January of the third calendar year before the survey, but the tables are restricted to children born in the three years preceding the survey. For any given woman, information was obtained for a maximum of two births.

Initiation of breastfeeding immediately after childbirth is important because it benefits both the mother and the infant. As soon as the infant starts suckling at the breast, the hormone oxytocin is released, resulting in uterine contractions that facilitate expulsion of the placenta and reduce the risk of postpartum haemorrhage. It is also recommended that the first breast milk (colostrum) should be given to the child rather than squeezed from the breast and discarded, because it provides natural immunity to the child.

Table 7.8 shows the percentage of children born during the three years before the survey who started breastfeeding within one hour and one day of birth. It also gives the percentage of children whose mothers squeezed the first milk from the breast before breastfeeding, which is not the recommended practice. Although breastfeeding is nearly universal in India, very few children are put to the breast immediately after birth. Only 16 percent of children began breastfeeding within one hour of birth, and only 37 percent began breastfeeding within one day. Nearly two-thirds of women (63 percent) squeezed the first milk from the breast before they began breastfeeding.

Differentials in the early initiation of breastfeeding and in squeezing the first milk from the breast are also shown in Table 7.8. With the exception of women in the 'other religion' category, no more than 30 percent of children in any group were put to the breast within one hour of birth. Between one-quarter and two-thirds of children were first breastfed in the first day of their life. The early initiation of breastfeeding is relatively high for urban women, women with at least a middle school education, women from several religious groups (Christian, Jain, Buddhist, 'other', and none), women from scheduled tribes, and women from households with a high standard of living. The circumstances surrounding delivery of the baby can have an important effect on the early initiation of breastfeeding. Children whose delivery was assisted by a health professional, as well as children born in health facilities, tend to initiate breastfeeding relatively early. Mizoram and Tamil Nadu are the only states in which a majority of children were breastfed within one hour of birth (Table 7.9). Less than 10 percent of children were breastfed within one hour of birth in Rajasthan, Punjab, Bihar, Uttar Pradesh, and Madhya Pradesh. In those five states plus Haryana, only one-third of children or less were first put to the breast within one day of birth.

The custom of squeezing the first milk from the breast before breastfeeding a child is widely practised in India, but it is more common in rural areas and for children whose mothers are illiterate, scheduled-tribe children, Sikhs and those with no religion, children whose mothers work on the family farm or in a family business, children living in households with a low to medium standard of living, children born at home, and children born without the assistance of a health professional. It should be stressed, however, that contrary to recommendations for feeding infants, mothers squeeze the first milk from the breast before breastfeeding for a majority of children in all groups. In 20 of the 25 states, the mothers of most children squeeze the first milk from the breast before breastfeeding (Table 7.9). The only exceptions are Tamil Nadu, Manipur, Bihar, Goa, and Arunachal Pradesh.

Table 7.8 Initiation of breastfeeding

Percentage of children born during the three years preceding the survey who started breastfeeding within one hour and within one day of birth and percentage whose mother squeezed the first milk from her breast before breastfeeding by selected background characteristics, India, 1998–99

Background characteristic	Percentage started breastfeeding within one hour of birth	Percentage started breastfeeding within one day of birth[1]	Percentage whose mother squeezed first milk from breast	Number of children
Residence				
Urban	19.2	45.0	58.8	7,191
Rural	14.8	34.8	64.0	25,202
Mother's education				
Illiterate	12.7	29.9	66.6	19,061
Literate, < middle school complete	18.3	43.5	62.0	5,818
Middle school complete	21.3	48.2	56.7	2,935
High school complete and above	22.2	51.6	52.4	4,574
Religion				
Hindu	15.0	36.0	62.5	25,650
Muslim	17.4	37.6	64.4	5,120
Christian	29.4	65.8	50.2	753
Sikh	8.7	23.6	83.4	450
Jain	17.4	47.3	57.2	76
Buddhist/Neo-Buddhist	29.6	59.1	66.4	199
Other	41.2	66.2	54.4	87
No religion	27.6	65.7	75.7	24
Caste/tribe				
Scheduled caste	15.3	34.5	64.3	6,478
Scheduled tribe	19.7	45.6	67.8	3,080
Other backward class	15.9	36.7	56.6	10,404
Other	15.3	37.2	65.7	12,050
Mother's work status				
Working in family farm/business	12.7	32.8	67.8	4,198
Employed by someone else	17.9	38.5	63.1	4,792
Self-employed	15.1	42.1	61.9	1,099
Not worked in past 12 months	16.0	37.3	61.9	22,295
Standard of living index				
Low	15.1	34.1	63.9	11,804
Medium	15.8	37.4	63.4	15,080
High	16.8	42.7	58.5	5,112
Assistance during delivery				
Health professional[2]	21.5	49.4	55.4	13,715
Dai (TBA)	11.0	27.9	65.7	11,323
Other	12.8	28.6	73.3	7,252
Place of delivery				
Public health facility	27.1	59.0	55.6	5,247
NGO or trust hospital/clinic	16.0	52.1	55.5	234
Private health facility	20.7	48.1	50.6	5,409
Own home	12.2	28.7	68.6	17,224
Parents' home	10.9	29.8	66.3	3,945
Other	8.6	32.4	66.0	225
Total	15.8	37.1	62.8	32,393

Note: Table includes only the two most recent births during the three years preceding the survey, whether living or dead at the time of interview. Total includes 5, 33, 380, 9, 397, 103, and 108 children with missing information on mother's education, religion, caste/tribe, mother's work status, the standard of living index, assistance during delivery, and place of delivery, respectively, who are not shown separately.
TBA: Traditional birth attendant; NGO: Nongovernmental organization
[1]Includes children who started breastfeeding within one hour of birth
[2]Includes doctor, auxiliary nurse midwife, nurse, midwife, lady health visitor, and other health professionals

Table 7.9 Initiation of breastfeeding by state

Percentage of children born during the three years preceding the survey who started breastfeeding within one hour and within one day of birth and percentage whose mother squeezed the first milk from her breast before breastfeeding by state, India, 1998–99

State	Percentage started breastfeeding within one hour of birth	Percentage started breastfeeding within one day of birth[1]	Percentage whose mother squeezed first milk from breast
India	15.8	37.1	62.8
North			
Delhi	23.8	51.2	59.9
Haryana	11.7	31.1	76.5
Himachal Pradesh	20.7	42.3	86.2
Jammu & Kashmir	20.8	59.2	77.1
Punjab	6.1	19.5	87.3
Rajasthan	4.8	33.6	69.1
Central			
Madhya Pradesh	9.9	29.3	71.1
Uttar Pradesh	6.5	13.4	75.6
East			
Bihar	6.2	20.7	42.1
Orissa	24.9	63.2	58.1
West Bengal	25.0	50.6	76.3
Northeast			
Arunachal Pradesh	49.0	77.1	49.5
Assam	44.7	77.6	64.1
Manipur	27.0	47.5	39.9
Meghalaya	26.7	71.6	66.9
Mizoram	54.0	78.2	60.7
Nagaland	24.5	70.2	59.8
Sikkim	31.4	73.4	74.5
West			
Goa	34.4	61.8	47.4
Gujarat	10.1	36.6	61.1
Maharashtra	22.8	47.7	66.4
South			
Andhra Pradesh	10.3	37.3	52.4
Karnataka	18.5	41.5	61.4
Kerala	42.9	92.0	52.8
Tamil Nadu	50.3	78.7	21.5

Note: Table includes only the two most recent births during the three years preceding the survey, whether living or dead at the time of interview.
[1]Includes children who started breastfeeding within one hour of birth

Mothers of children born in the three years before the survey were asked if the child had been given plain water, other liquids, or solid or mushy (semi-solid) food at any time during the day or night before the interview. Results are shown in Tables 7.10 and 7.11. Children who received nothing but breast milk during that period are defined as being *exclusively breastfed.* The introduction of supplementary foods before four months of age may put infants at risk of malnutrition because other liquids and solid foods are nutritionally inferior to breast milk. Consumption of liquids and solid or mushy foods at an early age also increases children's exposure to pathogens and consequently puts them at a greater risk of getting diarrhoea. However, a recent study based on findings from NFHS-1 (Anandaiah and Choe, 2000) concluded that breastfeeding with supplements is more beneficial than exclusive breastfeeding

Table 7.10 Breastfeeding status by child's age

Percent distribution of children under age 3 years by breastfeeding status, according to child's age in months, India, 1998–99

Age in months	Breastfeeding status						
	Not breastfeeding	Exclusively breastfeeding	Breastfeeding and:			Total percent	Number of living children
			Receiving plain water only	Receiving supplements	Don't know if fed supplements		
< 1	3.7	72.0	14.4	9.9	0.0	100.0	452
1	1.2	61.0	21.1	16.7	0.0	100.0	973
2	2.2	54.2	23.3	20.3	0.0	100.0	1,087
3	1.7	43.3	27.5	27.5	0.0	100.0	1,023
4	1.6	37.0	25.9	35.4	0.0	100.0	986
5	2.2	25.3	28.8	43.6	0.2	100.0	1,006
6	2.9	19.4	28.2	49.4	0.0	100.0	968
7	3.9	13.1	24.8	57.9	0.2	100.0	922
8	4.8	10.0	19.1	66.0	0.2	100.0	821
9	6.5	6.3	20.0	67.2	0.0	100.0	791
10	6.1	6.3	15.7	71.4	0.5	100.0	719
11	6.6	3.4	12.6	77.3	0.1	100.0	681
12	7.7	2.7	8.8	80.8	0.0	100.0	797
13	10.3	2.3	9.9	77.4	0.1	100.0	961
14	13.3	1.6	6.8	77.7	0.6	100.0	1,008
15	12.5	1.4	6.4	79.8	0.0	100.0	960
16	13.6	1.6	6.4	78.0	0.3	100.0	1,006
17	15.6	0.9	4.2	79.0	0.3	100.0	939
18	21.2	0.7	5.0	73.1	0.0	100.0	906
19	23.2	0.6	5.1	70.9	0.1	100.0	741
20	30.1	0.7	3.5	65.1	0.6	100.0	706
21	28.9	1.1	4.6	65.3	0.0	100.0	717
22	32.2	0.5	4.4	62.9	0.0	100.0	682
23	33.6	0.2	4.9	60.8	0.4	100.0	652
24	41.0	0.3	2.6	55.8	0.2	100.0	699
25	47.8	0.3	3.4	48.3	0.3	100.0	886
26	47.4	0.3	1.8	50.3	0.3	100.0	903
27	51.6	0.0	1.5	46.5	0.4	100.0	920
28	54.0	0.1	0.9	44.5	0.4	100.0	869
29	58.4	0.1	0.5	40.8	0.2	100.0	935
30	55.6	0.1	1.7	42.6	0.0	100.0	934
31	57.5	0.2	0.8	41.5	0.0	100.0	827
32	63.5	0.2	0.1	36.2	0.0	100.0	714
33	61.4	0.0	0.7	37.8	0.2	100.0	679
34	62.7	0.1	1.1	35.9	0.2	100.0	741
35	60.2	0.1	2.0	37.4	0.3	100.0	706
< 4 months	2.0	55.2	22.8	20.0	0.0	100.0	3,535
4–6 months	2.2	27.3	27.6	42.8	0.1	100.0	2,959
7–9 months	5.0	10.0	21.4	63.4	0.1	100.0	2,534

Note: Table includes only surviving children from among the two most recent births during the three years preceding the survey. Breastfeeding status refers to the day or night before the interview. Children classified as 'breastfeeding and receiving plain water only' receive no supplements.

even for children at very young ages (less than four months). That report suggests that mothers who are not well nourished and who are in poor health themselves may not be able to provide adequate breast milk for their infants.

In India, only 55 percent of children under four months of age are exclusively breastfed, 23 percent receive breast milk plus water, and 20 percent receive supplements along with breast milk (Table 7.10). The percentage of infants exclusively breastfed drops steadily from 72 percent for children under one month of age to 6 percent for children who are nine months old. Very few older children are exclusively breastfed. The proportion of children receiving breast milk and

supplements increases from 10 percent for children in the first month of life to 81 percent for children age 12 months, and declines thereafter as children are weaned from the breast and their food consumption no longer supplements breast milk. However, breastfeeding generally continues for a long period. Ninety-two percent of children are still being breastfed at 12 months of age, as are 59 percent of children at 24 months of age. For the majority of children in India, breastfeeding usually stops at about 26–27 months of age, but 40 percent of children are still breastfed at age 35 months.

Table 7.11 and Figure 7.2 show in more detail the types of food consumed by children under age three years the day or night before the interview. Because of the small number of non-breastfeeding children, one-month age categories have been combined into two-month groups for the youngest children. Powdered milk is rarely given to young children at any age, but other milk (such as cow's milk or buffalo's milk) is given to young children more often. Except for children under two months of age, more than 60 percent of non-breastfeeding children in each age group were given these other types of milk the day or night before the interview. About one-third to one-half of breastfeeding children age 6–35 months received non-powdered milk in addition to breast milk. For all children under age three years, milk is given more often than other liquids, although the differences are not large for children once they become two years old. The consumption of green, leafy vegetables generally increases with age, from less than 3 percent for children age 6 months or less to 50 percent or more at age 24–35 months. The consumption of fruits is negligible for children less than six months old, but it increases rapidly thereafter, reaching a plateau of about one-third of children age 18–35 months. Even among non-breastfeeding children, the majority did not eat any fruit the day or night before the interview.

From about six months of age, the introduction of complementary food is critical for meeting the protein, energy, and micronutrient needs of children. However, in India the introduction of complementary food is delayed for a substantial proportion of children. Only 24 percent of breastfeeding children who are 6 months old consume solid or mushy foods. This proportion rises to only 46 percent at 9 months of age. Even at 12 months of age, more than one-quarter of breastfeeding children did not eat any solid or mushy food the day or night before the interview. Only 35 percent of breastfeeding children age 6–9 months receive solid or mushy food, as recommended.

Bottle feeding has a direct effect on the mother's exposure to the risk of pregnancy because the period of amenorrhoea may be shortened when breastfeeding is reduced or replaced by bottle feeding. Because it is often difficult to sterilize the nipple properly, the use of bottles with nipples also exposes children to an increased risk of getting diarrhoea and other diseases. For children who are being breastfed, the use of bottles with nipples is not common in India. In every age group, less than 18 percent of breastfeeding children drank anything from a bottle with a nipple during the day or night before the interview (Table 7.11). The use of a bottle with a nipple is much more common for children who are not being breastfed, particularly during the first year of life.

Table 7.11 Type of food received by children

Percentage of children under age 3 years who received specific types of food the day or night before the interview and percentage using a bottle with a nipple by current breastfeeding status and child's age in months, India, 1998–99

Age in months	Type of food received						Using bottle with a nipple	Number of living children
	Powdered milk	Any other milk	Any other liquid	Green, leafy vegetables	Fruits	Any solid or mushy food[1]		
BREASTFEEDING CHILDREN								
< 1	1.3	6.5	3.1	0.7	0.9	1.4	3.7	436
1	2.0	13.1	3.9	0.5	1.1	2.2	7.5	962
2	3.6	14.4	4.1	0.5	0.4	1.9	9.8	1,063
3	6.0	18.9	6.1	0.5	0.7	3.7	15.4	1,005
4	5.1	22.9	8.1	1.1	3.2	10.7	14.5	970
5	7.6	28.9	12.7	1.4	2.7	14.8	16.8	984
6	4.6	32.5	17.7	2.2	6.9	23.6	16.2	940
7	6.3	36.2	20.6	4.9	9.7	30.9	14.8	886
8	8.0	41.5	26.8	10.8	13.5	43.6	17.7	782
9	6.1	43.0	28.1	10.4	13.8	45.5	15.7	739
10	4.4	42.8	32.6	13.8	17.2	57.3	16.3	675
11	8.0	45.1	35.2	18.7	20.9	64.8	14.4	636
12	3.9	50.0	39.5	25.8	24.2	71.1	14.3	735
13	5.1	43.9	42.0	26.1	20.9	72.1	11.4	862
14	3.6	48.7	41.6	29.0	20.2	77.4	11.6	874
15	5.3	49.8	43.6	33.7	26.4	81.7	9.7	841
16	3.6	47.9	44.3	35.6	23.7	76.6	11.2	869
17	3.2	50.6	48.1	37.8	26.9	84.1	8.8	792
18	6.1	52.1	48.2	38.9	27.7	82.2	9.1	714
19	2.6	51.5	46.6	36.8	26.6	80.7	8.4	570
20	5.0	53.3	46.2	37.2	32.4	85.4	12.4	494
21	2.9	47.7	51.7	40.2	26.3	79.7	6.4	510
22	3.4	49.2	48.0	37.4	30.5	83.8	8.5	462
23	3.8	42.2	43.9	38.7	27.6	81.8	7.8	433
24	5.2	48.5	50.7	47.1	27.4	87.9	5.7	412
25	4.1	42.8	45.9	45.0	27.0	86.9	6.1	463
26	5.2	50.5	49.3	51.3	24.3	89.4	7.0	475
27	3.1	52.2	50.4	52.4	30.1	88.9	4.8	446
28	5.3	56.2	55.1	51.3	25.7	90.8	7.1	399
29	3.2	56.3	53.7	53.6	22.9	90.6	8.7	389
30	3.9	53.4	54.1	52.6	29.8	90.3	6.0	415
31	5.8	47.5	53.0	57.6	30.9	91.3	6.9	352
32	2.5	51.2	58.1	51.2	27.7	91.0	7.2	261
33	3.6	46.2	61.2	53.9	30.6	92.4	8.0	262
34	4.8	42.1	45.0	56.5	27.2	91.0	4.9	276
35	1.7	46.1	54.1	49.1	27.0	87.6	6.7	281
< 4 months	3.6	14.4	4.5	0.6	0.7	2.5	10.0	3,466
4–5 months	6.4	25.9	10.4	1.3	2.9	12.8	15.6	1,953
6–9 months	6.2	37.9	22.9	6.8	10.7	35.0	16.1	3,346

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Table 7.11 Type of food received by children (contd.)

Percentage of children under age 3 years who received specific types of food the day or night before the interview and percentage using a bottle with a nipple by current breastfeeding status and child's age in months, India, 1998–99

Age in months	Type of food received						Using bottle with a nipple	Number of living children
	Powdered milk	Any other milk	Any other liquid	Green, leafy vegetables	Fruits	Any solid or mushy food[1]		
NON-BREASTFEEDING CHILDREN								
< 2	(13.0)	(42.3)	(6.1)	(4.7)	(0.1)	(5.2)	(40.0)	28
2–3	(22.4)	(62.2)	(12.8)	(0.0)	(0.0)	(11.7)	(87.0)	41
4–5	(46.6)	(70.2)	(32.9)	(8.0)	(8.6)	(30.5)	(86.6)	38
6	(15.7)	(89.9)	(44.7)	(18.0)	(17.4)	(41.1)	(58.4)	28
7	(26.6)	(69.7)	(36.5)	(14.8)	(18.8)	(49.1)	(75.3)	36
8	(30.2)	(83.5)	(29.8)	(11.5)	(21.7)	(64.4)	(91.5)	39
9	38.6	66.8	45.2	15.8	21.2	59.4	81.1	52
10	32.9	77.9	34.3	16.1	23.8	75.9	85.6	44
11	27.7	72.3	35.4	26.8	35.5	81.0	71.5	45
12	4.2	93.4	51.9	24.9	47.5	78.2	54.4	61
13	14.2	80.8	55.1	42.0	39.2	88.2	55.0	99
14	11.7	90.4	53.8	42.7	33.8	86.1	52.4	134
15	8.3	85.1	53.4	45.1	46.0	90.7	37.2	120
16	11.3	78.7	55.1	46.5	37.5	87.3	45.4	137
17	9.8	85.0	56.7	45.0	46.0	92.3	37.6	147
18	11.0	74.8	55.9	37.9	46.0	89.9	25.3	192
19	3.0	78.9	57.1	51.0	54.4	93.1	28.0	172
20	4.6	72.3	53.0	40.9	35.1	85.8	26.6	212
21	6.8	71.7	61.5	46.8	41.5	89.9	20.9	208
22	6.6	74.4	50.2	46.1	59.5	91.3	22.0	219
23	8.1	74.2	56.0	52.6	54.0	92.3	25.6	219
24	3.7	73.1	58.6	53.8	42.2	92.9	22.0	286
25	5.1	67.9	63.7	58.0	35.8	93.7	14.6	423
26	4.9	68.6	61.6	55.2	44.6	93.8	13.7	428
27	5.0	65.2	61.2	51.8	34.2	90.5	15.9	475
28	2.3	66.9	62.0	57.3	37.8	94.7	12.8	469
29	3.6	69.7	61.0	57.2	41.2	92.4	15.2	547
30	3.9	67.4	66.8	55.1	39.7	91.9	15.6	519
31	2.8	70.0	61.2	55.9	40.9	92.9	9.8	475
32	4.1	69.5	60.8	56.7	38.0	91.4	13.3	454
33	5.2	64.5	60.3	57.9	41.7	93.2	12.8	417
34	4.1	60.6	62.1	57.3	42.3	93.9	11.2	464
35	4.8	64.9	58.3	60.0	42.8	95.8	9.2	425
< 4 months	18.6	54.1	10.1	1.9	0.0	9.0	67.9	69
4–5 months	(46.6)	(70.2)	(32.9)	(8.0)	(8.6)	(30.5)	(86.6)	38
6–9 months	29.5	75.9	39.2	14.9	20.1	54.9	78.3	155

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Table 7.11 Type of food received by children (contd.)

Percentage of children under age 3 years who received specific types of food the day or night before the interview and percentage using a bottle with a nipple by current breastfeeding status and child's age in months, India, 1998–99

| Age in months | Type of food received | | | | | | Using bottle with a nipple | Number of living children |
	Powdered milk	Any other milk	Any other liquid	Green, leafy vegetables	Fruits	Any solid or mushy food[1]		
				ALL CHILDREN				
< 1	1.5	7.5	3.4	0.8	0.9	1.5	4.2	452
1	2.3	13.6	3.8	0.6	1.0	2.3	8.3	973
2	4.0	15.4	4.2	0.5	0.4	2.2	11.3	1,087
3	6.3	19.7	6.3	0.5	0.7	3.8	16.8	1,023
4	6.1	23.7	8.2	1.1	3.3	11.0	15.8	986
5	8.2	29.8	13.4	1.6	2.8	15.2	18.2	1,006
6	4.9	34.1	18.5	2.7	7.2	24.1	17.4	968
7	7.1	37.5	21.2	5.3	10.1	31.6	17.2	922
8	9.0	43.5	27.0	10.8	13.9	44.5	21.2	821
9	8.2	44.6	29.3	10.7	14.3	46.4	20.0	791
10	6.2	45.0	32.7	13.9	17.6	58.4	20.5	719
11	9.3	46.9	35.2	19.2	21.9	65.9	18.1	681
12	3.9	53.3	40.5	25.7	26.0	71.6	17.4	797
13	6.1	47.7	43.4	27.7	22.8	73.8	15.9	961
14	4.7	54.2	43.2	30.8	22.0	78.6	17.0	1,008
15	5.7	54.2	44.8	35.1	28.8	82.8	13.1	960
16	4.7	52.1	45.8	37.1	25.6	78.0	15.8	1,006
17	4.2	56.0	49.5	38.9	29.9	85.4	13.3	939
18	7.1	56.9	49.8	38.7	31.6	83.8	12.6	906
19	2.7	57.9	49.1	40.1	33.1	83.5	13.0	741
20	4.9	59.0	48.3	38.3	33.2	85.6	16.6	706
21	4.0	54.6	54.5	42.1	30.7	82.7	10.6	717
22	4.4	57.3	48.7	40.2	39.8	86.2	12.9	682
23	5.2	52.9	48.0	43.4	36.5	85.3	13.8	652
24	4.6	58.6	54.0	49.8	33.4	89.9	12.4	699
25	4.6	54.8	54.4	51.2	31.2	90.1	10.1	886
26	5.1	59.1	55.1	53.1	33.9	91.5	10.1	903
27	4.1	58.9	56.0	52.1	32.2	89.7	10.5	920
28	3.7	62.0	58.8	54.5	32.3	92.9	10.2	869
29	3.4	64.1	58.0	55.7	33.6	91.7	12.5	935
30	3.9	61.2	61.1	54.0	35.3	91.2	11.3	934
31	4.0	60.5	57.7	56.7	36.7	92.2	8.6	827
32	3.5	62.9	59.8	54.7	34.2	91.2	11.1	714
33	4.6	57.4	60.6	56.3	37.4	92.9	11.0	679
34	4.4	53.7	55.8	57.0	36.7	92.8	8.8	741
35	3.6	57.4	56.6	55.6	36.5	92.5	8.2	706
< 4 months	3.9	15.2	4.6	0.6	0.7	2.6	11.2	3,535
4–5 months	7.1	26.8	10.8	1.4	3.0	13.1	17.0	1,991
6–9 months	7.2	39.6	23.6	7.1	11.1	35.9	18.8	3,501

Note: Table includes only surviving children from among the two most recent births during the three years preceding the survey. Percents by type of food may sum to more than 100.0 because children may have received more than one type of food.
( ) Based on 25–49 unweighted cases
[1]Includes green, leafy vegetables and fruits

Figure 7.2
Percentage of Breastfeeding Children Given Milk, Other Liquid, or Solid/Mushy Food the Day or Night Before the Interview
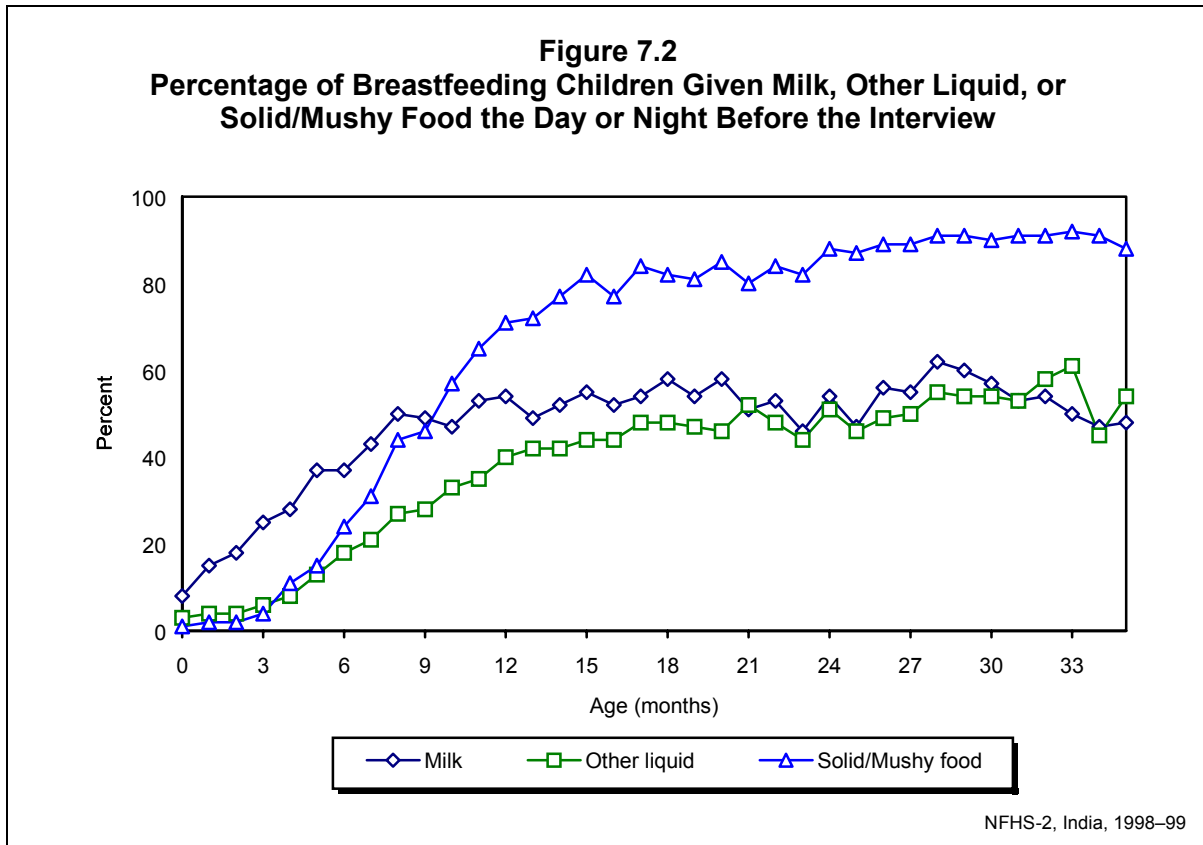
NFHS-2, India, 1998–99

Table 7.12 shows several statistics that describe the duration of breastfeeding. Estimates of both means and medians are based on the current proportions of children breastfeeding in each age group because information on current status is usually more accurate than information based on mother's recall. The median length of any breastfeeding is slightly more than two years (25.4 months). Supplementation begins relatively early, however. The median length of exclusive breastfeeding is 1.9 months and the median length of exclusive breastfeeding or breastfeeding with water only is 5.3 months.

The mean durations of any breastfeeding, exclusive breastfeeding, and exclusive breastfeeding or breastfeeding with water only are 25.2 months, 4.0 months, and 7.2 months, respectively. The mean durations are slightly longer than the median durations for the last two measures, but are about the same for the overall duration of breastfeeding.

An alternative measure of the duration of breastfeeding is the prevalence-incidence mean, which is calculated as the 'prevalence' of breastfeeding divided by its 'incidence'. In this case, prevalence is defined as the number of children whose mothers were breastfeeding at the time of the survey, and incidence is defined as the average number of births per month (averaged over a 36–month period to overcome problems of seasonality of births and possible reference-period errors). For each measure of breastfeeding, the prevalence-incidence mean is about the same as the mean calculated in the conventional manner.

Table 7.12 Median duration of breastfeeding

Median duration of breastfeeding among children under age 3 years by selected background characteristics, and mean duration of breastfeeding, India, 1998–99

| Background characteristic | Median duration (months)[1] | | | Number of children |
	Any breastfeeding	Exclusive breastfeeding	Exclusive breastfeeding or breastfeeding plus water only	
Sex of child				
Male	26.4	1.8	5.2	16,805
Female	24.6	2.0	5.5	15,588
Residence				
Urban	21.8	0.9	3.7	7,191
Rural	26.3	2.2	5.7	25,202
Mother's education				
Illiterate	27.1	2.4	6.6	19,061
Literate, < middle school complete	24.2	1.5	4.4	5,818
Middle school complete	23.7	0.7	3.8	2,935
High school complete and above	21.4	1.3	3.2	4,574
Religion				
Hindu	25.8	2.0	5.5	25,650
Muslim	24.5	1.8	5.1	5,120
Christian	23.1	1.6	3.1	753
Sikh	21.7	0.6	4.2	450
Jain	16.9	1.0	2.4	76
Buddhist/Neo-Buddhist	25.6	2.5	4.7	199
Other	27.1	5.7	8.6	87
No religion	≥ 36.0	0.4	0.5	24
Caste/tribe				
Scheduled caste	26.4	2.2	5.9	6,478
Scheduled tribe	27.7	3.1	7.3	3,080
Other backward class	24.3	2.1	5.6	10,404
Other	24.8	1.3	4.2	12,050
Mother's work status				
Working in family farm/business	26.8	2.4	6.1	4,198
Employed by someone else	28.2	2.5	6.0	4,792
Self-employed	≥ 36.0	2.2	4.5	1,099
Not worked in past 12 months	24.7	1.7	5.1	22,295
Standard of living index				
Low	28.5	2.5	6.6	11,804
Medium	24.8	1.9	5.2	15,080
High	22.0	0.8	3.3	5,112
Place of delivery				
Public health facility	23.9	1.2	3.6	5,247
NGO or trust hospital/clinic	23.2	1.8	5.0	234
Private health facility	21.3	1.6	3.8	5,409
Own home	27.3	2.2	6.3	17,224
Parents' home	25.3	2.4	6.2	3,945
Other	27.6	2.5	3.5	225
Median duration	25.4	1.9	5.3	32,393
Mean duration (months)[1]	25.2	4.0	7.2	32,393
Prevalence/incidence mean	24.8	3.5	6.9	32,393

Note: Table includes only the two most recent births during the three years preceding the survey. Total includes 5, 33, 380, 9, 397, and 108 children with missing information on mother's education, religion, caste/tribe, mother's work status, the standard of living index, and place of delivery, respectively, who are not shown separately. The median duration of any breastfeeding is shown as ≥ 36 months for groups in which the exact median cannot be calculated because the proportion of breastfeeding children does not drop below 50 percent in any age group for children under 36 months of age.
NGO: Nongovernmental organization
[1]Based on current status

The median duration of breastfeeding is two months shorter for girls than for boys. This pattern is often observed in societies where there is a strong preference for sons, since the parents may stop breastfeeding a girl at a younger age to increase their chances of having another child earlier (with the hope that the next child will be a boy). The median length of breastfeeding is five months longer in rural areas than in urban areas. Most children living in rural areas are breastfed for more than two years. Children in urban areas are exclusively breastfed for a very short median period of less than one month. The median duration of breastfeeding decreases steadily with increasing educational attainment and increasing standard of living. The duration of breastfeeding is particularly short for Jains and particularly long for children in the 'no religion' category, but both of these estimates are based on a small number of children. Working women breastfeed their children for a longer time than women who do not work, a pattern that was also observed in NFHS-1. Children who are born at home tend to be breastfed for several more months than children who are born in health facilities.

The median duration of breastfeeding is at least 20 months in every state except Tamil Nadu, where it is only 16 months (Table 7.13). There are five states (mostly in the Eastern Region), where the exact median duration of breastfeeding cannot be calculated because the proportion of breastfeeding children does not drop below 50 percent in any age group for children under 36 months of age. In these states, the median duration of breastfeeding is 36 months or longer. Andhra Pradesh is the only state where the median duration of exclusive breastfeeding is more than four months. The median duration of exclusive breastfeeding or breastfeeding plus water only is eight months or less in every state.

The recommended feeding indicators for young children are summarized for every state in Table 7.14. Just over half of children in India (55 percent) are exclusively breastfed for the recommended period of four months. This percentage varies widely from less than 20 percent in Delhi, Meghalaya, Sikkim, and Himachal Pradesh to 75 percent in Andhra Pradesh. As noted earlier, the introduction of solid or mushy food in addition to breast milk is much later than recommended for the majority of children in India. The worst performing states in this respect are Bihar, Uttar Pradesh, and Rajasthan, where less than 20 percent of children receive timely complementary feeding. Children in Kerala and several states in the Northeastern Region are most likely to receive timely complementary feeding. Prolonged breastfeeding is common throughout India, with 89 percent of children still being breastfed at age 12–15 months and 69 percent being breastfed at age 20–23 months. In every state except Tamil Nadu, at least 70 percent of children are breastfed at age 12–15 months and at least 45 percent are breastfed at age 20–23 months. More than 80 percent of children age 20–23 months are breastfed in the contiguous states of Assam, West Bengal, Sikkim, Bihar, and Orissa. Bottle feeding of infants is most common in Goa (63 percent), Delhi (41 percent), and Tamil Nadu (34 percent). These are states that also exhibited unusually high levels of bottle feeding in NFHS-1.

7.5   Nutritional Status of Children

Nutritional status is a major determinant of the health and well-being of children. Inadequate or unbalanced diets and chronic illness are associated with poor nutrition among children. To assess their nutritional status, measurements of weight and height/length were obtained for children born in the three years preceding the survey. Children were weighed and measured with the same type of scales and measuring boards used for women. Children under two years of age were

Table 7.13 Median duration of breastfeeding by state

Median duration of any, exclusive, and full breastfeeding among children under age 3 years by state, India, 1998–99

State	Median duration (months)[1]		
	Any breastfeeding	Exclusive breastfeeding	Exclusive breastfeeding or breastfeeding plus water only
India	25.4	1.9	5.3
North			
Delhi	22.6	0.5	1.7
Haryana	24.3	1.2	3.9
Himachal Pradesh	24.1	0.6	2.8
Jammu & Kashmir	29.5	1.5	3.8
Punjab	21.2	0.7	2.9
Rajasthan	25.5	1.8	6.2
Central			
Madhya Pradesh	≥ 36.0	2.6	6.6
Uttar Pradesh	25.8	2.2	5.7
East			
Bihar	≥ 36.0	1.9	7.5
Orissa	≥ 36.0	1.8	5.3
West Bengal	≥ 36.0	1.1	2.9
Northeast			
Arunachal Pradesh	30.8	0.6	2.3
Assam	≥ 36.0	1.2	3.2
Manipur	29.3	3.1	3.8
Meghalaya	22.6	0.5	0.7
Mizoram	21.8	0.7	4.3
Nagaland	23.1	0.7	3.7
Sikkim	27.3	0.5	0.7
West			
Goa	23.3	0.5	0.7
Gujarat	22.0	3.0	5.9
Maharashtra	23.8	1.0	5.9
South			
Andhra Pradesh	25.0	4.6	5.1
Karnataka	20.0	3.2	5.6
Kerala	24.5	2.8	3.4
Tamil Nadu	16.1	1.8	3.5

Note: Table includes only the two most recent births during the three years preceding the survey. The median duration of any breastfeeding is shown as ≥ 36 months for states in which the exact median cannot be calculated because the proportion of breastfeeding children does not drop below 50 percent in any age group for children under 36 months of age.
[1]Based on current status

measured lying down and older children were measured standing up. Data on weight and height/length were used to calculate the following three summary indices of nutritional status:

- weight-for-age
- height-for-age
- weight-for-height

Table 7.14 Recommended feeding indicators by state

Recommended feeding indicators for children age 0–23 months by state, India, 1998–99

State	Recommended feeding indicators				
	Percentage of children 0–3 months who are exclusively breastfed	Percentage of children 6–9 months who receive breast milk and solid/mushy food	Percentage of children 12–15 months who are breastfed	Percentage of children 20–23 months who are breastfed	Percentage of children <12 months who are bottle fed
India	55.2	33.5	88.9	68.9	15.9
North					
Delhi	13.2	37.0	70.4	59.9	41.0
Haryana	47.2	41.8	88.3	77.5	15.9
Himachal Pradesh	17.5	61.3	73.1	60.2	30.8
Jammu & Kashmir	41.5	38.9	90.0	69.5	32.3
Punjab	36.3	38.7	76.0	53.8	30.2
Rajasthan	53.7	17.5	91.5	76.3	12.1
Central					
Madhya Pradesh	64.2	27.3	91.4	73.2	11.4
Uttar Pradesh	56.9	17.3	87.9	78.6	16.8
East					
Bihar	55.2	15.0	95.1	85.1	10.3
Orissa	58.0	30.1	94.6	89.7	13.8
West Bengal	48.8	46.3	95.8	86.9	21.1
Northeast					
Arunachal Pradesh	(33.9)	(60.2)	(94.1)	(76.0)	6.6
Assam	42.5	58.5	96.1	83.5	12.5
Manipur	69.7	86.8	90.8	67.9	13.0
Meghalaya	16.1	77.1	91.2	63.2	30.9
Mizoram	40.7	(74.2)	(89.9)	47.4	18.4
Nagaland	43.9	81.3	83.7	(61.4)	23.1
Sikkim	16.3	87.3	89.6	(82.0)	20.0
West					
Goa	*	(65.4)	(76.0)	(56.5)	63.2
Gujarat	65.2	46.5	86.2	56.1	6.3
Maharashtra	38.5	30.8	89.0	63.7	14.7
South					
Andhra Pradesh	74.6	59.4	84.6	60.6	13.2
Karnataka	66.5	38.4	86.5	44.9	11.4
Kerala	68.5	72.9	95.5	61.8	20.4
Tamil Nadu	48.3	55.4	69.4	29.0	34.1

Note: Table includes only the two most recent births in the three years preceding the survey.
( ) Based on 25–49 unweighted cases
*Percentage not shown; based on fewer than 25 unweighted cases

The nutritional status of children calculated according to these three measures is compared with the nutritional status of an international reference population recommended by the World Health Organization (Dibley et al., 1987a; 1987b). The use of this reference population is based on the empirical finding that well-nourished children in all population groups for which data exist follow very similar growth patterns (Martorell and Habicht, 1986). A scientific report from the Nutrition Foundation of India (Agarwal et al., 1991) has concluded that the WHO standard is generally applicable to Indian children.

Table 7.15 Nutritional status of children by demographic characteristics

Percentage of children under age 3 years classified as undernourished on three anthropometric indices of nutritional status, according to selected demographic characteristics, India, 1998–99

Demographic characteristic	Weight-for-age		Height-for-age		Weight-for-height		
	Percentage below −3 SD	Percentage below −2 SD[1]	Percentage below −3 SD	Percentage below −2 SD[1]	Percentage below −3 SD	Percentage below −2 SD[1]	Number of children
Age of child							
< 6 months	2.0	11.9	4.2	15.4	1.9	9.3	4,203
6–11 months	11.8	37.5	11.3	30.9	2.8	13.2	4,116
12–23 months	23.1	58.5	29.8	57.5	4.1	21.9	8,295
24–35 months	24.1	58.4	32.0	56.5	1.9	13.2	7,986
Sex of child							
Male	16.9	45.3	21.8	44.1	2.9	15.7	12,822
Female	19.1	48.9	24.4	47.0	2.7	15.2	11,778
Birth order							
1	13.6	40.9	17.8	39.6	2.8	14.5	7,111
2–3	16.3	46.2	21.8	44.4	2.5	15.0	10,893
4–5	23.8	52.9	28.5	52.3	3.2	16.8	4,287
6+	28.5	58.6	35.2	56.2	3.3	18.2	2,309
Previous birth interval[2]							
First birth	13.6	41.0	17.9	39.7	2.8	14.5	7,144
< 24 months	21.3	52.2	27.9	50.8	3.1	15.8	3,908
24–47 months	19.8	50.0	25.6	48.9	2.5	15.6	9,753
48+ months	18.0	45.1	21.2	42.4	3.2	16.5	3,794
Total	18.0	47.0	23.0	45.5	2.8	15.5	24,600

Note: Each index is expressed in standard deviation units (SD) from the median of the International Reference Population.
[1]Includes children who are below −3 SD from the International Reference Population median
[2]First-born twins (triplets, etc.) are counted as first births because they do not have a previous birth interval.

The three indices of nutritional status are expressed in standard deviation units (z-scores) from the median for the international reference population. Children who are more than two standard deviations below the reference median on any of the indices are considered to be *undernourished*, and children who fall more than three standard deviations below the reference median are considered to be *severely undernourished*.

Each of these indices provides somewhat different information about the nutritional status of children. Weight-for-age is a composite measure that takes into account both chronic and acute undernutrition. Children who are more than two standard deviations below the reference median on this index are considered to be *underweight*. The height-for-age index measures linear growth retardation. Children who are more than two standard deviations below the median of the reference population in terms of height-for-age are considered short for their age or *stunted*. The percentage in this category indicates the prevalence of chronic undernutrition, which often results from a failure to receive adequate nutrition over a long period of time or from chronic or recurrent diarrhoea. Height-for-age, therefore, does not vary appreciably by the season in which data are collected.
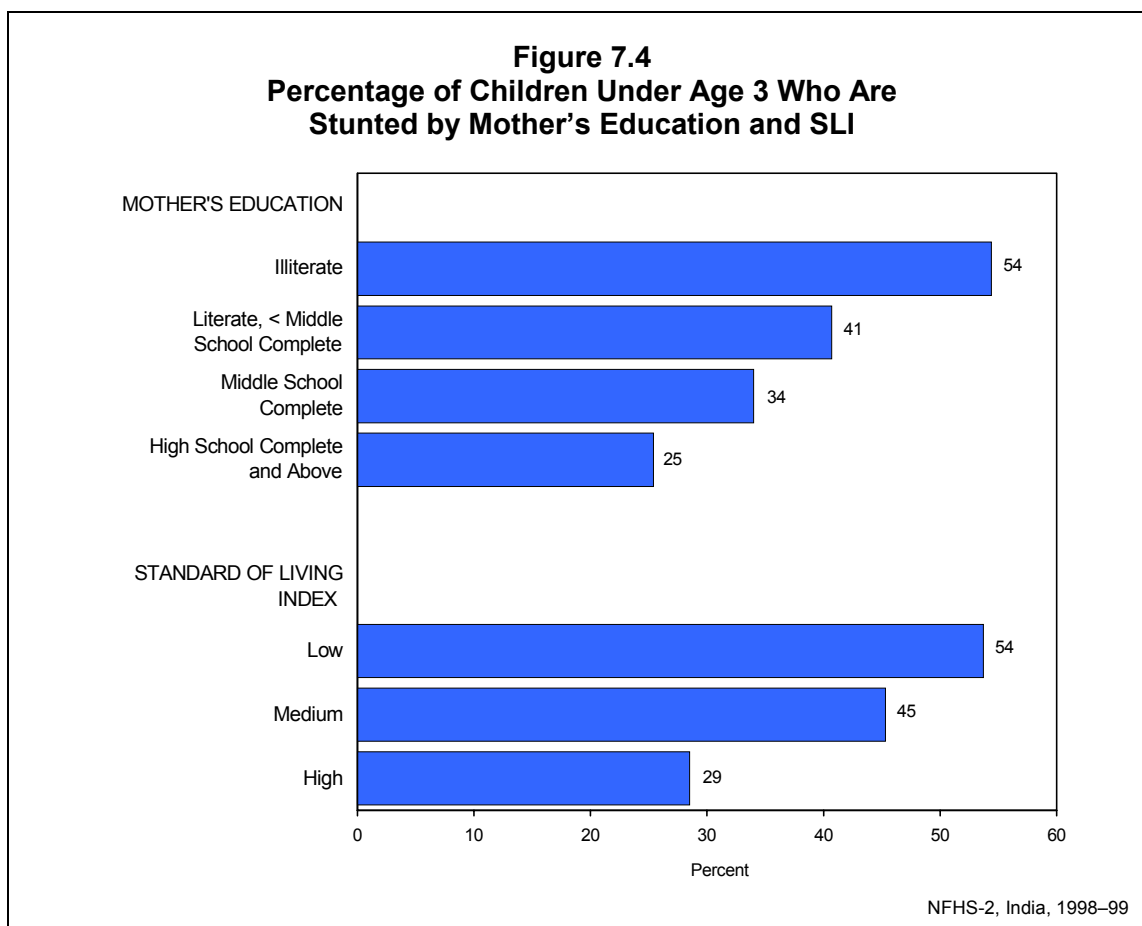
The weight-for-height index examines body mass in relation to body length. Children who are more than two standard deviations below the median of the reference population in terms of weight-for-height are considered too thin or *wasted*. The percentage in this category

Figure 7.3
Percentage of Children Under Age 3 Who Are Underweight
NFHS-1 and NFHS-2

India
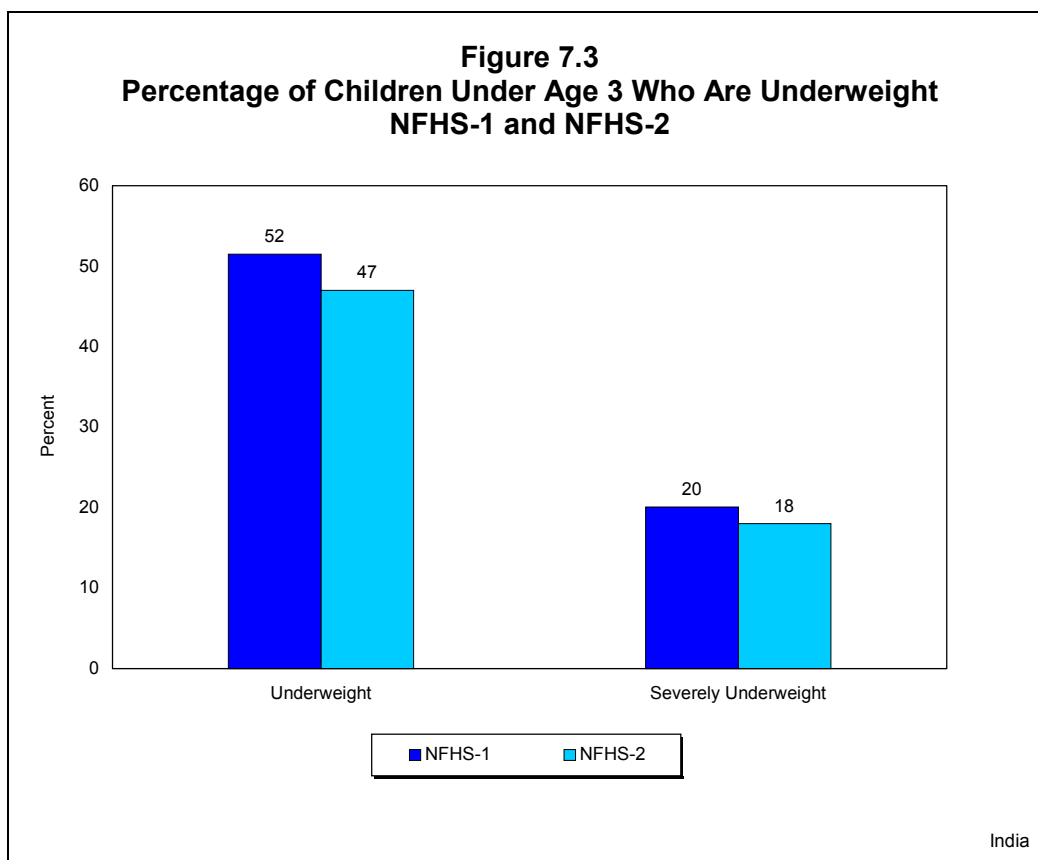
indicates the prevalence of acute undernutrition. Wasting is associated with a failure to receive adequate nutrition in the period immediately before the survey and may be the result of seasonal variations in food supply or recent episodes of illness.

The validity of these indices is determined by many factors, including the coverage of the population of children and the accuracy of the anthropometric measurements. The survey was not able to measure the height and weight of all eligible children, usually because the child was not at home at the time of the health investigator's visit or because the mother refused to allow the child to be weighed and measured. In India, NFHS-2 did not measure 13 percent of children under age three (see Table D.3 in Appendix D). Also excluded from the analysis are children whose month and year of birth were not known and those with grossly improbable height or weight measurements. In addition, two of the three indices (weight-for-age and height-for-age) are sensitive to misreporting of children's ages, including heaping on preferred digits.

Table 7.15 shows the percentage of children classified as undernourished by selected demographic characteristics. Almost half of children under three years of age (47 percent) are underweight, and a similar percentage (46 percent) are stunted. The proportion of children who are severely undernourished is also notable—18 percent according to weight-for-age and 23 percent according to height-for-age. Wasting is also quite evident in India, affecting 16 percent of children under three years of age. The proportion of children under three years of age who are underweight decreased from 52 percent in NFHS-1 to 47 percent in NFHS-2 (Figure 7.3), and the proportion severely underweight decreased from 20 percent to 18 percent. A similar comparison cannot be made at the national level for stunting and wasting because children's height was not measured in five states in NFHS-1.

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Figure 7.4
Percentage of Children Under Age 3 Who Are
Stunted by Mother's Education and SLI

MOTHER'S EDUCATION

Category	Percent
Illiterate	54
Literate, < Middle School Complete	41
Middle School Complete	34
High School Complete and Above	25

STANDARD OF LIVING INDEX

Category	Percent
Low	54
Medium	45
High	29

Percent

NFHS-2, India, 1998–99

The proportion of children who are undernourished increases rapidly with the child's age through age 12–23 months, where it peaks at 22 percent for wasting and 58–59 percent for the other two measures. Even during the first six months of life, when most babies are breastfed, 9–15 percent of children are undernourished according to the three nutritional indices. It is notable that at age 24–35 months, when most children have been weaned from breast milk, almost one-third of children are severely stunted and almost one-quarter are severely underweight.

Overall, girls and boys are about equally undernourished, but girls are slightly more likely than boys to be underweight and stunted, whereas boys are slightly more likely to be wasted. Undernutrition generally increases with increasing birth order. Young children in families with six or more children are nutritionally the most disadvantaged. First births have lower than average levels of undernutrition on almost all the measures, and children born after a short birth interval are more likely than other children to be stunted or underweight.

Table 7.16 shows the nutritional status of children by selected background characteristics. Undernutrition is substantially higher in rural areas than in urban areas. Even in urban areas, however, more than one-third of children are underweight or stunted. Children whose mothers are illiterate are about twice as likely to be undernourished as children whose mothers have completed at least high school (see Figure 7.4) and the differentials are even larger in the case of severe undernutrition.

Table 7.16 Nutritional status of children by background characteristics

Percentage of children under age 3 years classified as undernourished on three anthropometric indices of nutritional status, according to selected background characteristics, India, 1998–99

Background characteristic	Weight-for-age		Height-for-age		Weight-for-height		
	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	Number of children
Residence							
Urban	11.6	38.4	15.4	35.6	2.2	13.1	5,757
Rural	19.9	49.6	25.4	48.5	3.0	16.2	18,842
Mother's education							
Illiterate	24.1	55.0	30.2	54.4	3.4	17.1	13,878
Literate, < middle school complete	13.1	44.6	18.3	40.7	2.0	15.3	4,634
Middle school complete	10.8	36.6	13.4	34.0	2.5	13.3	2,400
High school complete and above	5.8	26.6	8.2	25.4	1.6	11.0	3,685
Religion							
Hindu	18.4	47.7	23.3	46.0	2.9	16.0	19,572
Muslim	18.6	48.3	24.8	47.1	2.5	14.1	3,745
Christian	9.6	30.8	14.0	30.6	2.5	13.4	582
Sikh	8.4	26.8	16.0	35.4	1.1	7.0	365
Jain	1.3	20.9	0.8	13.2	0.0	11.9	60
Buddhist/Neo-Buddhist	7.5	43.7	8.7	32.5	0.9	11.9	168
Other	19.1	49.6	11.2	44.0	0.4	17.7	68
No religion	20.1	44.1	26.9	54.4	0.0	5.0	17
Caste/tribe							
Scheduled caste	21.2	53.5	27.5	51.7	3.0	16.0	4,919
Scheduled tribe	26.0	55.9	27.6	52.8	4.4	21.8	2,236
Other backward class	18.3	47.3	23.1	44.8	3.4	16.6	7,941
Other	13.8	41.1	19.4	40.7	1.8	12.8	9,265
Mother's work status							
Working in family farm/business	22.9	56.0	29.3	52.8	3.3	17.7	3,134
Employed by someone else	24.6	55.5	26.9	51.8	3.8	19.6	3,602
Self-employed	21.4	51.7	24.7	47.7	2.8	19.3	838
Not worked in past 12 months	15.5	43.3	21.0	42.7	2.5	14.0	17,018
Mother's height							
< 145 cm	28.3	59.8	36.8	60.7	2.9	17.1	3,100
≥ 145 cm	16.5	45.1	21.1	43.3	2.8	15.2	21,458
Mother's body mass index							
< 18.5 kg/m^2	23.4	57.2	25.9	50.3	3.0	19.6	9,824
≥ 18.5 kg/m^2	14.4	40.2	21.2	42.3	2.7	12.7	14,698
Standard of living index							
Low	25.3	56.9	29.8	53.7	3.9	19.7	8,548
Medium	16.5	46.8	22.4	45.3	2.4	14.3	11,636
High	6.7	26.8	10.7	28.5	1.5	10.2	4,137
Total	18.0	47.0	23.0	45.5	2.8	15.5	24,600

Note: Each index is expressed in standard deviation units (SD) from the median of the International Reference Population. Total includes 3, 23, 239, 7, 42, 78, and 278 children with missing information on mother's education, religion, caste/tribe, mother's work status, mother's height, mother's body mass index, and the standard of living index, respectively, who are not shown separately.
[1]Includes children who are below –3 SD from the International Reference Population median

Hindu and Muslim children are equally likely to be undernourished, but Christian, Sikh, and Jain children are considerably better nourished. Children belonging to scheduled castes, scheduled tribes, or other backward classes have relatively high levels of undernutrition according to all three measures. Children from scheduled tribes have the poorest nutritional

Table 7.17 Nutritional status of children by state

Percentage of children under age 3 years classified as undernourished on three anthropometric indices of nutritional status, according to state, India, 1998–99

State	Weight-for-age		Height-for-age		Weight-for-height	
	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]	Percentage below –3 SD	Percentage below –2 SD[1]
India	18.0	47.0	23.0	45.5	2.8	15.5
North						
Delhi	10.1	34.7	18.0	36.8	4.1	12.5
Haryana	10.1	34.6	24.3	50.0	0.8	5.3
Himachal Pradesh	12.1	43.6	18.1	41.3	3.3	16.9
Jammu & Kashmir	8.3	34.5	17.3	38.8	1.2	11.8
Punjab	8.8	28.7	17.2	39.2	0.8	7.1
Rajasthan	20.8	50.6	29.0	52.0	1.9	11.7
Central						
Madhya Pradesh	24.3	55.1	28.3	51.0	4.3	19.8
Uttar Pradesh	21.9	51.7	31.0	55.5	2.1	11.1
East						
Bihar	25.5	54.4	33.6	53.7	5.5	21.0
Orissa	20.7	54.4	17.6	44.0	3.9	24.3
West Bengal	16.3	48.7	19.2	41.5	1.6	13.6
Northeast						
Arunachal Pradesh	7.8	24.3	11.9	26.5	2.0	7.9
Assam	13.3	36.0	33.7	50.2	3.3	13.3
Manipur	5.3	27.5	11.2	31.3	1.8	8.2
Meghalaya	11.3	37.9	24.5	44.9	1.0	13.3
Mizoram	5.0	27.7	13.9	34.6	2.8	10.2
Nagaland	7.4	24.1	11.7	33.0	2.4	10.4
Sikkim	4.2	20.6	9.7	31.7	0.8	4.8
West						
Goa	4.7	28.6	4.8	18.1	0.7	13.1
Gujarat	16.2	45.1	23.3	43.6	2.4	16.2
Maharashtra	17.6	49.6	14.1	39.9	2.5	21.2
South						
Andhra Pradesh	10.3	37.7	14.2	38.6	1.6	9.1
Karnataka	16.5	43.9	15.9	36.6	3.9	20.0
Kerala	4.7	26.9	7.3	21.9	0.7	11.1
Tamil Nadu	10.6	36.7	12.0	29.4	3.8	19.9

Note: Each index is expressed in standard deviation units (SD) from the median of the International Reference Population.
[1]Includes children who are below –3 SD from the International Reference Population median

status, and the high prevalence of wasting in this group (22 percent) is of particular concern. Interestingly, undernutrition is relatively low for children whose mothers have not worked in the past 12 months.

The nutritional status of children is strongly related to maternal nutritional status. Undernutrition is much more common for children of mothers whose height is less than 145 centimetres or whose body mass index is below 18.5 than for other children. All of the measures of undernutrition are strongly related to the household's standard of living. Children from households with a low standard of living are twice as likely to be undernourished as children from households with a high standard of living.

Figure 7.5
Anaemia Among Children

NFHS-2, India, 1998–99
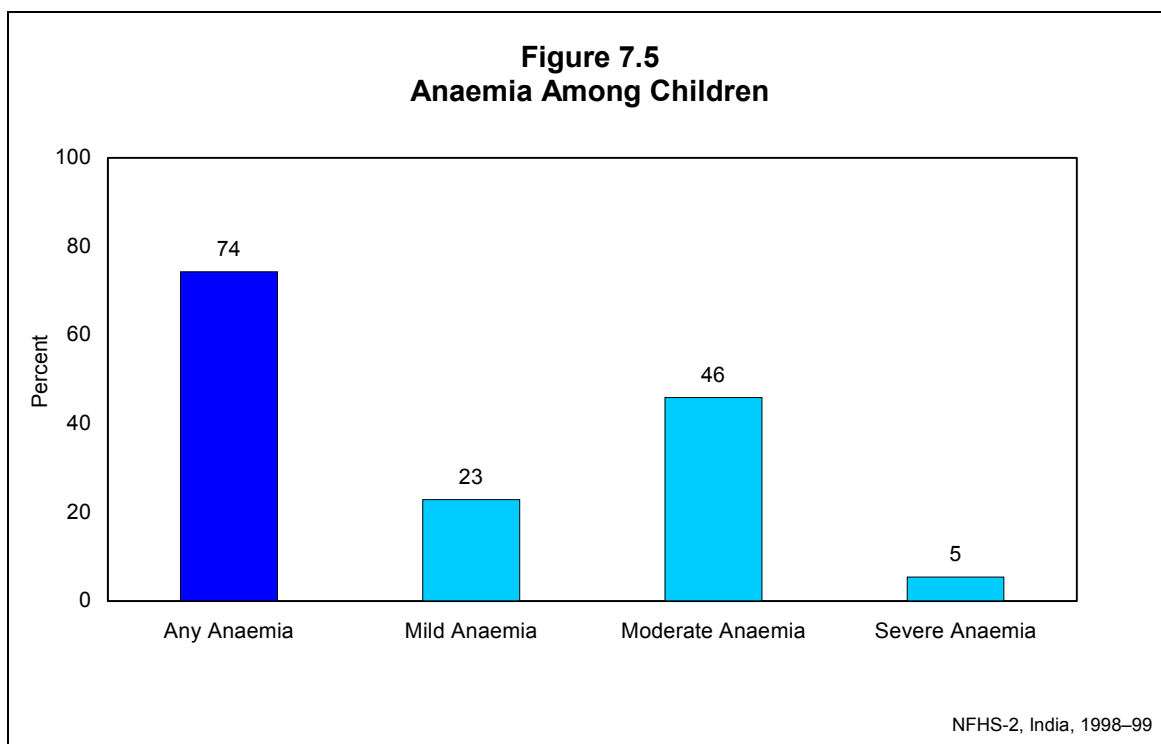
Inadequate nutrition is a problem throughout India, but the situation is considerably better in some states. Table 7.17 shows that undernutrition is most pronounced in Bihar, Madhya Pradesh, Orissa, Uttar Pradesh, and Rajasthan. In addition, Maharashtra, Karnataka, and Tamil Nadu are all characterized by high levels of wasting among children. Nutritional problems are least evident in Sikkim, Arunachal Pradesh, Goa, and Kerala. Even in these states, however, levels of undernutrition are unacceptably high.

7.6   Anaemia Among Children

Anaemia is a serious concern for young children because it can result in impaired cognitive performance, behavioural and motor development, coordination, language development, and scholastic achievement, as well as increased morbidity from infectious diseases (Seshadri, 1997). One of the most vulnerable groups is children age 6–24 months (Stoltzfus and Dreyfuss, 1998).

Table 7.18 and Figure 7.5 show anaemia levels for children age 6–35 months. Overall, nearly three-quarters (74 percent) of these children have some level of anaemia[4], including 23 percent who are mildly anaemic (10.0–10.9 g/dl), 46 percent who are moderately anaemic (7.0–9.9 g/dl), and 5 percent who are severely anaemic (less than 7.0 g/dl). Notably, a much larger proportion of children than women are anaemic and the difference is particularly pronounced in the case of moderate to severe anaemia.

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[4]If the hemoglobin measurements are not adjusted for the altitude of the enumeration area, the estimated prevalence of anaemia is only slightly lower (73.7 percent instead of 74.3 percent).

Table 7.18 Anaemia among children

Percentage of children age 6–35 months classified as having iron-deficiency anaemia by selected background characteristics, India, 1998–99

| Background characteristic | Percentage of children with anaemia | Percentage of children with: | | | Number of children |
		Mild anaemia	Moderate anaemia	Severe anaemia	
Age of child					
6–11 months	71.7	27.0	41.5	3.2	3,923
12–23 months	77.7	22.0	49.4	6.3	8,215
24–35 months	72.0	21.9	44.5	5.6	7,877
Sex of child					
Male	75.1	22.2	47.0	5.9	10,477
Female	73.3	23.7	44.8	4.8	9,539
Birth order					
1	70.7	23.6	42.5	4.6	5,759
2–3	74.9	22.7	46.4	5.8	8,896
4–5	76.4	22.7	48.0	5.7	3,459
6+	78.4	22.4	50.3	5.7	1,902
Residence					
Urban	70.8	23.7	42.0	5.1	4,642
Rural	75.3	22.7	47.1	5.5	15,374
Mother's education					
Illiterate	78.2	21.7	50.0	6.4	11,255
Literate, < middle school complete	74.6	24.4	45.1	5.1	3,866
Middle school complete	69.7	25.2	40.2	4.3	1,959
High school complete and above	61.9	24.0	35.1	2.8	2,935
Religion					
Hindu	74.6	22.4	46.7	5.5	15,982
Muslim	74.2	26.0	43.0	5.2	2,952
Christian	61.0	23.7	34.1	3.3	500
Sikh	76.5	18.0	52.8	5.7	304
Jain	(69.4)	(20.7)	(48.7)	(0.0)	44
Buddhist/Neo-Buddhist	73.3	27.9	41.9	3.5	139
Other	88.9	16.9	57.0	15.0	60
No religion	(55.1)	(11.9)	(40.7)	(2.5)	16
Caste/tribe					
Scheduled caste	78.3	22.0	49.7	6.6	4,048
Scheduled tribe	79.8	22.8	50.1	6.9	1,921
Other backward class	72.0	22.8	44.4	4.8	6,487
Other	72.7	23.6	44.1	5.0	7,373
Mother's work status					
Working in family farm/business	75.8	21.8	49.3	4.7	2,669
Employed by someone else	76.9	21.7	48.7	6.6	3,067
Self-employed	74.8	20.6	48.6	5.5	707
Not worked in past 12 months	73.3	23.6	44.5	5.3	13,566
Standard of living index					
Low	78.7	23.1	50.0	5.7	7,064
Medium	73.5	22.7	45.2	5.7	9,444
High	67.3	23.5	39.6	4.2	3,292
Mother's anaemia status					
Not anaemic	67.8	23.2	40.7	3.9	9,172
Mildly anaemic	76.8	23.4	48.4	5.1	7,235
Moderately anaemic	85.6	21.6	55.5	8.5	3,212
Severely anaemic	86.8	18.0	45.3	23.6	323
Total	74.3	22.9	45.9	5.4	20,016

Note: Haemoglobin levels are adjusted for altitude when calculating the degree of anaemia. Total includes 2, 20, 187, 7, 215, and 73 children with missing information on mother's education, religion, caste/tribe, mother's work status, the standard of living index, and mother's anaemia status, respectively, who are not shown separately.
( ) Based on 25–49 unweighted cases

Table 7.19 Anaemia among children by state

Percentage of children age 6–35 months classified as having iron-deficiency anaemia by state, India, 1998–99

State	Percentage of children with anaemia	Percentage of children with:		
		Mild anaemia	Moderate anaemia	Severe anaemia
India	74.3	22.9	45.9	5.4
North				
Delhi	69.0	22.2	42.9	3.9
Haryana	83.9	18.0	58.8	7.1
Himachal Pradesh	69.9	28.7	39.0	2.2
Jammu & Kashmir	71.1	29.1	38.5	3.5
Punjab	80.0	17.4	56.7	5.9
Rajasthan	82.3	20.1	52.7	9.5
Central				
Madhya Pradesh	75.0	22.0	48.1	4.9
Uttar Pradesh	73.9	19.4	47.8	6.7
East				
Bihar	81.3	26.9	50.3	4.1
Orissa	72.3	26.2	43.2	2.9
West Bengal	78.3	26.9	46.3	5.2
Northeast				
Arunachal Pradesh	54.5	29.1	24.7	0.7
Assam	63.2	31.0	32.2	0.0
Manipur	45.2	22.6	21.7	0.9
Meghalaya	67.6	23.4	39.8	4.3
Mizoram	57.2	32.2	22.7	2.3
Nagaland	43.7	22.0	18.7	3.0
Sikkim	76.5	28.4	40.7	7.5
West				
Goa	53.4	23.5	27.9	2.0
Gujarat	74.5	24.2	43.7	6.7
Maharashtra	76.0	24.1	47.4	4.4
South				
Andhra Pradesh	72.3	23.0	44.9	4.4
Karnataka	70.6	19.6	43.3	7.6
Kerala	43.9	24.4	18.9	0.5
Tamil Nadu	69.0	21.9	40.2	6.9

Note: Haemoglobin levels are adjusted for altitude when calculating the degree of anaemia.

Several groups of children have particularly high levels of anaemia. These include children age 12–23 months, children of higher birth orders, rural children, children whose mothers are illiterate, Sikh children and children of 'other' religions, children from scheduled castes and scheduled tribes, and children from poor families. As expected, there is a strong positive relationship between the haemoglobin levels of mothers and prevalence of anaemia among children. Almost one-quarter of children whose mothers are severely anaemic are severely anaemic themselves.

Table 7.19 and Figure 7.6 show the level of anaemia by state. Nagaland, Kerala, and Manipur are the only states where less than half of the children are anaemic. The highest prevalence of anaemia is found in Haryana, Rajasthan, Bihar, and Punjab, where at least 80 percent of children are anaemic. In these four states, 54–66 percent of children are moderately or severely anaemic.

Figure 7.6
Anaemia Among Children by State

NFHS-2, India, 1998–99
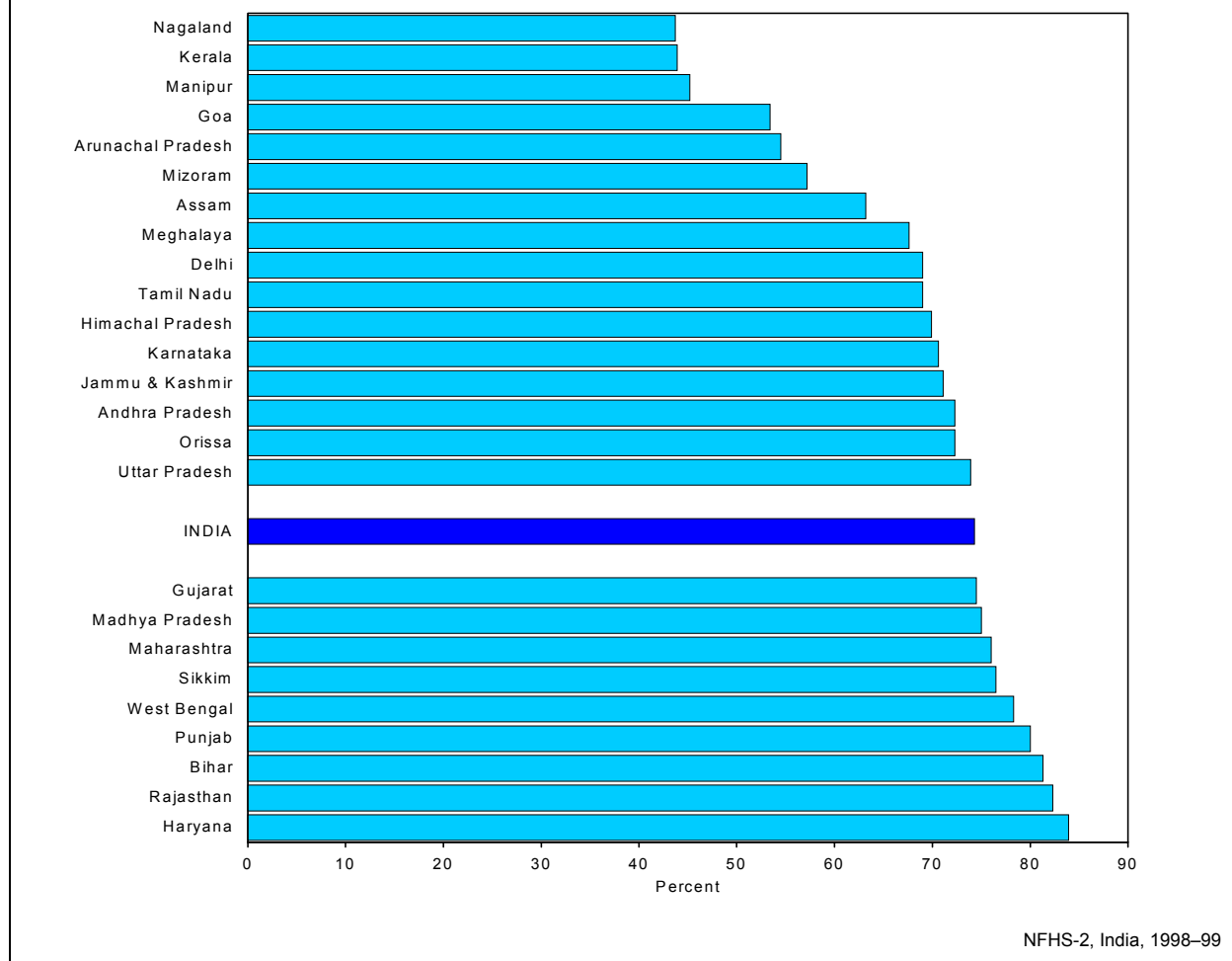
7.7   Iodization of Salt

Iodine is an important micronutrient. A lack of iodine in the diet can lead to Iodine Deficiency Disorders (IDD), which, according to the World Health Organization, can cause miscarriages, brain disorders, cretinism, and retarded psychomotor development. Iodine deficiency is the single most important and preventable cause of mental retardation worldwide.

It has been estimated that 200 million people in India are exposed to the risk of iodine deficiency and 70 million suffer from goitre and other IDDs (IDD & Nutrition Cell, 1998). In addition, about one-fifth of pregnant women are at considerable risk of giving birth to children who will not reach their optimum physical and mental potential because of maternal iodine deficiency (Vir, 1995).

Iodine deficiency can be avoided by using salt that has been fortified with iodine. In 1983–84, the Government of India adopted a policy to achieve universal iodization of edible salt by 1992. In 1988, the Prevention of Food Adulteration Act was amended to fix the minimum iodine content of salt at 30 parts per million (ppm) at the manufacturing level and 15 ppm at the

consumer level (MOHFW, 1994). The Government of India has advised all states and union territories to issue notifications banning the sale of edible salt that is not iodized. However, the ban on non-iodized salt was lifted in September, 2000.

NFHS-2, with its representative sample of households throughout the country, is an ideal vehicle for measuring the degree of iodization of salt used in households in India. Iodine levels in salt can be measured in the laboratory using a standard titration test or in the field using a rapid-test kit. In NFHS-2, interviewers measured the iodine content of cooking salt in each interviewed household using a rapid-test kit. The test kit consists of ampoules of a stabilized starch solution and of a weak acid-based solution. The interviewer squeezes one drop of the starch solution onto a sample of cooking salt obtained from the household. If the colour changes (from light blue through dark violet), the interviewer matches the colour of the salt as closely as possible to a colour chart on the test kit and records the iodine level as 7, 15, or 30 ppm. If the initial test is negative (no change in colour), the interviewer is required to conduct a second confirmatory test on a new salt sample, using the acid-based solution in addition to the starch solution. This test is necessary because the starch solution will not show any colour change even on iodized salt if the salt is alkaline or is mixed with alkaline free-flow agents. If the colour of the salt does not change even after the confirmatory test, the salt is not iodized. Because of uncertainties and subjective judgement in the matching process, the rapid test should not be seen as giving an exact quantitative estimate of salt iodization, but it does provide useful information on whether or not salt is iodized, as well as the extent of iodization. A recent multicentric study in eight centres in India concluded that the rapid test kit can be used for semi-quantitative estimation of the iodine content of salt to monitor the quality of salt being used in a community (Kapil et al., 1999).

Table 7.20 shows the extent of salt iodization at the household level. Overall, despite government regulations in effect at the time of the survey, only 49 percent of households use cooking salt that is iodized at the recommended level of 15 ppm or more. More than one-quarter of households (28 percent) use salt that is not iodized at all and 22 percent use salt that is inadequately iodized (less than 15 ppm). Differentials in salt iodization by background characteristics are pronounced. Seventy-seven percent of households in large cities use salt with 15 ppm or more of iodine compared with 67–68 percent of households in small cities and towns and only 42 percent of households in rural areas. Among religious groups, households with Jain or Sikh heads are most likely to use adequately iodized salt. The use of iodized salt is relatively low in households headed by persons from scheduled castes, scheduled tribes, or other backward classes. The widest differentials are observed for the standard of living index. Seventy-eight percent of households with a high standard of living use adequately iodized salt compared with only 35 percent of households with a low standard of living.

Table 7.20 Iodization of salt

Percent distribution of households by degree of iodization of salt, according to selected background characteristics, India, 1998–99

Background characteristic	Not iodized	7 ppm	15 ppm	30 ppm	Missing	Total percent	Number of households
Type of place of residence							
Large city	14.8	7.8	11.1	65.7	0.7	100.0	6,745
Small city	17.7	14.1	12.5	55.2	0.5	100.0	7,393
Town	19.3	13.6	13.7	52.8	0.6	100.0	11,106
Rural area	32.5	25.3	18.3	23.2	0.7	100.0	65,953
Religion of household head							
Hindu	29.3	22.1	16.3	31.6	0.7	100.0	74,699
Muslim	23.1	23.0	21.2	32.1	0.6	100.0	10,662
Christian	33.3	16.5	12.2	37.9	0.1	100.0	2,716
Sikh	17.1	8.2	15.7	58.7	0.3	100.0	1,556
Jain	12.6	6.2	13.0	68.1	0.0	100.0	363
Buddhist/Neo-Buddhist	26.4	9.1	16.1	47.5	0.9	100.0	749
Other	19.7	22.2	20.3	37.7	0.0	100.0	306
No religion	28.9	19.2	14.1	37.6	0.3	100.0	59
Caste/tribe of household head							
Scheduled caste	32.0	25.5	17.4	24.4	0.8	100.0	17,051
Scheduled tribe	34.0	22.1	18.6	24.7	0.6	100.0	8,337
Other backward class	33.9	23.2	15.9	26.5	0.5	100.0	29,543
Other	20.7	18.2	16.7	43.7	0.7	100.0	35,386
Standard of living index							
Low	36.0	28.1	18.6	16.5	0.8	100.0	33,064
Medium	28.6	21.5	17.5	31.7	0.6	100.0	40,434
High	12.8	9.2	11.6	66.0	0.4	100.0	16,640
Total	28.4	21.6	16.8	32.6	0.7	100.0	91,196

Note: Total includes 87, 880, and 1,057 households with missing information on religion, caste/tribe, and the standard of living index, respectively, which are not shown separately.
ppm: Parts per million

The use of iodized salt varies dramatically from one state to another. The variations are due to a number of factors, including the scale of salt production, transportation requirements, enforcement efforts, the pricing structure, and storage patterns. In particular, salt iodization is likely to be more common in states where salt is transported exclusively by railways, at least partly because the Salt Department monitors the iodine content of salt shipped by railways. The use of adequately iodized salt is uniformly high throughout the Northeastern Region and in most states in the Northern Region, reaching a high of 91 percent in Himachal Pradesh and Mizoram (Table 7.21). All of the states in the Southern Region have low levels of use of adequately iodized salt, ranging from only 21 percent in Tamil Nadu to 43 percent in Karnataka. Outside of the Southern Region, Orissa is the only state where less than 40 percent of households use adequately iodized salt. It is clear that in many states the lax enforcement of salt iodization regulations in effect at the time of NFHS-2 was thwarting efforts to eliminate Iodine Deficiency Disorders in India.

Table 7.21 Iodization of salt by state

Percent distribution of households by degree of iodization of salt, according to state, India, 1998–99

State	Not iodized	7 ppm	15 ppm	30 ppm	Missing	Total percent
India	28.4	21.6	16.8	32.6	0.7	100.0
North						
Delhi	6.1	4.5	13.5	75.7	0.1	100.0
Haryana	19.5	9.2	13.9	57.1	0.2	100.0
Himachal Pradesh	3.2	6.2	14.9	75.6	0.1	100.0
Jammu & Kashmir	24.8	22.3	27.5	25.4	0.0	100.0
Punjab	16.7	7.8	13.7	61.6	0.3	100.0
Rajasthan	37.1	15.3	21.9	24.4	1.3	100.0
Central						
Madhya Pradesh	25.0	16.3	14.4	42.3	2.1	100.0
Uttar Pradesh	22.7	26.9	19.6	29.2	1.6	100.0
East						
Bihar	22.9	30.1	26.6	20.4	0.0	100.0
Orissa	29.6	35.1	18.2	16.8	0.4	100.0
West Bengal	11.3	26.5	25.8	36.0	0.5	100.0
Northeast						
Arunachal Pradesh	0.8	15.0	46.9	37.2	0.1	100.0
Assam	1.8	18.2	32.7	46.9	0.3	100.0
Manipur	2.3	9.7	15.4	72.5	0.1	100.0
Meghalaya	6.7	30.0	24.9	38.1	0.3	100.0
Mizoram	0.7	8.0	27.9	63.3	0.0	100.0
Nagaland	10.9	21.2	25.5	41.7	0.7	100.0
Sikkim	3.1	17.5	31.8	47.3	0.3	100.0
West						
Goa	37.3	20.2	4.0	37.9	0.6	100.0
Gujarat	29.5	14.2	14.9	41.2	0.2	100.0
Maharashtra	32.0	6.9	11.0	49.1	1.0	100.0
South						
Andhra Pradesh	36.8	35.7	10.2	17.2	0.1	100.0
Karnataka	24.1	32.4	12.9	30.5	0.1	100.0
Kerala	47.6	13.2	5.6	33.7	0.0	100.0
Tamil Nadu	62.7	15.8	8.1	13.1	0.3	100.0

ppm: Parts per million